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ABSTRACT

Suitable for use with high school students, this booklet on arms control and national security provides background information, describes basic concepts, reviews recent history, and offers suggestions for further reading. The first section, on American attitudes toward national security and arms control, defines five types of limits on weapons systems, presenting examples of each. The second section, "U.S.-Soviet Strategic Competition," traces American attitudes toward the USSR and the use of nuclear weapons from the Truman Administration (1945-1952) to the Reagan Administration. Graphs depicting strategic arsenals of the superpowers and weapons and capabilities of the USSR and the United States are provided. A debate between students of two influential nuclear war theorists--Bernard Brodie and Herman Kahn--provides students with a look at key ideas of the two theorists. A third section focuses on the correlation of major world events and the strategic competition between the United States and the USSR. A fourth section discussing negotiations between the USSR and the United States focuses on the Strategic Arms Limitation Talks (SALT) and the more recent Strategic Arms Reduction Talks (START). The effects of nuclear weapons, the dangers of nuclear testing, chemical and biological weapons, nonproliferation, and theater nuclear weapons are the topics of the final section. A list of related readings and a glossary of arms control terms conclude the booklet. (LH)

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# Arms Control and National Security

## An Introduction

*"Wars occur because people prepare for conflict, rather than for peace." Trygve Lie*

*"No nation has ever gone to war because its military might was too strong." General George S. Patton*

The advent of nuclear weapons with the capability to wipe out whole societies means issues of war and peace concern us all. For Americans the central issues have become: how can we protect our national security in a way which does not lead to a general nuclear war? Is military strength the answer? What about arms control and disarmament? This pamphlet is designed to give readers background which will allow them to make up their own minds on such questions. It describes basic concepts, reviews some important recent history, and offers suggestions for further reading.

## National Security

What does "national security" mean? Clearly, the term *national security* signifies the protection of a nation's people and territory against foreign attack. In this narrow sense, national security is similar to the term, *defense*. National security, however, has a broader meaning than the protection of borders and human life. It also implies the protection of vital economic and political assets. National security is the protection of a nation's fundamental strengths and values.

What are the basic strengths and values of a nation? What is most important to our country? To answer these questions, each of us should first think about what is important to him or her personally. Some tangible items like food and shelter are obviously important to most of us. We also want to protect ourselves from harm by others. We gather together in communities, states and nations with the aim to provide better food, shelter and protection than we are able to seek on our own.

But this list of values is only the beginning. Early settlers in America endured great physical hardships and risked their lives for the political and religious freedoms they hoped to find here. To some people, intangible items like freedom, democracy and justice may be just as valuable as life itself.

As with individuals, a nation's basic values can include both tangible and intangible items. Some Americans believe that military forces are our most vital security asset. Others believe that military forces are emphasized too much, and that a strong economy is just as crucial to America's security. Still, it might be argued that America's real strength comes from its democratic system.

So the basic strengths and values of a nation are perceived differently by different people. What is important to one person is not necessarily important to another. National security, then, implies the protection of a wide range of values. Which values are most important, remains open to debate.

Just as there are different ways to look at national security, there are also different ways to protect it. Even when a nation is faced with an obvious military threat, military conflict is not always the inevitable response. Nations prefer not to resort to the extreme alternatives of war or surrender.

Nations often react to a threat (or a perceived threat) from a foreign military force by building up forces of their own. But how many and what kinds of forces will make a nation secure? Does a nation need forces that serve only to frighten away its enemies? Or does it need forces that will defeat and destroy an enemy in war? How can one tell the difference between an aggressive military force and a defensive military force? Does it make one nation more secure to threaten the security of another? And how are these questions different for a nation that possesses nuclear weapons as opposed to a nation with a completely conventional arsenal?

Perhaps just building-up forces is not enough. A nation may want to demonstrate its will to use its military if necessary. Forces can be postured to bluff an attack in the hope that the opponent will feel intimidated or at risk. Force posturing in this way can be a precarious business. How easy would it be for a small conflict to escalate into a full scale war? How would the circumstances be different if nuclear weapons were involved? Does the existence of nuclear weapons make conflict more or less likely?

Nations often form alliances in the face of threats. An enemy may be less likely to threaten if it must face more than one opponent. For this reason, alliances like the North Atlan-

Please turn to page 2



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tic Treaty Organization (NATO) and the Warsaw Pact were formed. When another nation pledges to help protect ours, we pledge to protect that nation as well. Does this added responsibility make it more likely that we will get into a war? By gaining more allies, do we also gain more enemies? How is a nation likely to react if other nations seem to be teaming-up against it?

Nations have still another way to seek security from outside threats. They establish rules and agreements through negotiation. Agreements and treaties can help to add order and predictability to international relations. They may be as common as trade agreements or air traffic regulations, or they may be historic border settlements or peace treaties. As much as nations normally interact, a world without international agreements would be chaotic.

In the United States, perceptions of national security have changed considerably since the birth of the nation. For most of its history, America has been geographically remote from the rest of the world. For years it was buffered from events in Europe and Asia by two vast oceans. Direct invasion by another country seemed improbable. As a young nation, the United States rarely saw the need to maintain a large standing army. Defense needs were met by summoning a militia at times of emergency. America's strength came from an innovative economy, its indigenous natural resources, and its political freedoms.

World War II dramatically changed America's perception of itself, its place in the world and its sense of national security. The United States entered the war after a direct Japanese attack on American bases at Pearl Harbor. It emerged from the war in a different world. The European-centered international system was replaced by a global system, with the United States and the Soviet Union as dominant actors.

The United States no longer seemed remote from the rest of the world. *Life* magazine wrote in September 1945, "We are in a different league now. How large the subject of security has grown, larger than a combined Army and Navy . . . The military problems ahead of us are all related to foreign policy and to each other."

Indeed, after World War II, U.S. security needs no longer seemed as simple as before. The term "national security," rarely used before World War II, has become a common expression and source of debate. It is often heard that America's national security is "at stake," and that dramatic and swift actions are needed to put things right. In this urgent atmosphere, the U.S. often turns to new weapons and greater military forces to ensure that its national security is protected.

But the threats to security are not always external ones. Nor are they always obvious. It is much easier to build an arsenal of weapons than to bring an economy under control, cure problems of resource depletion and cope with an energy crisis. As a result, attention is often diverted from some very real sources of danger to concentrate a nation's fears and defense against the military forces of an enemy. Citizens are right to feel alarmed if they perceive a military threat, but they should not ignore other threats to national security.

*"The fundamental purposes of our arms limitation efforts are to promote our own national security and to strengthen international stability, thereby enhancing the prospects for peace everywhere."*—Jimmy Carter

*"We'll make every effort to reach an agreement that will reduce the possibility of nuclear war."*—Ronald Reagan

There are many different meanings to the term national security. Notions of national security vary from person to person and from nation to nation. Perceptions of security are shaped by experience, culture, and even geography. National security is a complex subject. But it is not an exclusive field of study or something that only experts know about and analyze for us, or something that only militaries provide. It is up to each individual to consider what personal and national values are most important. It is also the responsibility of each citizen, not just politicians and generals, to make judgments about the best ways to protect those values. We must measure our priorities carefully, and we must be diligent and creative in finding solutions to our national security problems once we have determined them.

# Arms Control

The words "national security" come up most often in newspaper articles, President's speeches, or Congressional debates about U.S. military strength. This is because a strong military is one way to protect the basic values which make up national security.

But there are other ways to protect national security too. Throughout history, nations have also turned to *arms control*. Arms control is usually defined as: the placing of limits on the kinds and amounts of weapons nations have, in order to (1) make the chances of war smaller; (2) lessen the destructiveness of war if it occurs; and (3) to shrink the financial burden of military programs.

While this definition is a good place to begin, it leaves an important question unanswered: What types of limits on weapons systems can strengthen national security? For the answer we must look at history. We find that five types of limits have been used most often:

1. *Limiting the numbers of weapons.*
(a) ceilings—nations agree not to increase the number of weapons they have beyond a certain agreed-upon level. This is also sometimes called "putting a cap on" the arms race. Examples include:

| | | |
|---|---|---|
| 201 B.C. | Rome-Carthage Treaty | (ceilings on military forces) |
| 1922 | Washington Treaty | (ceilings on major warships) |
| 1930 | London Naval Treaty | (ceilings on warships) |
| 1972 | ABM Treaty | (ceilings on the number of ABM sites, two per side) |
| 1974 | Vladivostok Agreement | (ceilings on nuclear forces) |
| 1979 | SALT II | (ceilings on nuclear forces) |

(b) "freeze"—nations agree not to increase the number of weapons they already have. Examples include:

| | | |
|---|---|---|
| 1972 | SALT I | (froze offensive nuclear forces) |
| 1982 | Nuclear "Freeze" Campaign | (aims to freeze the number of nuclear weapons and launchers) |

(c) reductions—nations agree they will reduce the number of weapons they have. This is usually called disarmament. Examples include:

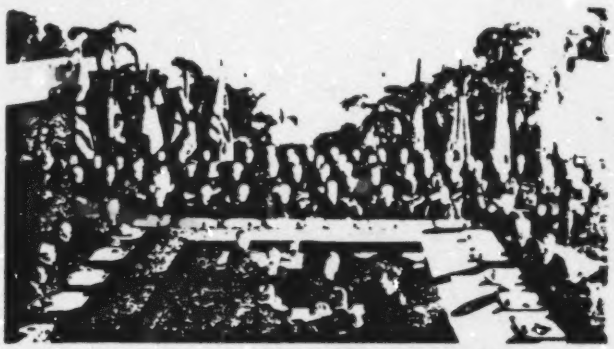
| | | |
|---|---|---|
| 1919 | Versailles Treaty | (German forces reduced) |
| 1979 | SALT II | (Soviets must reduce some of their forces) |
| 1981 | George Kennan Proposal | (A proposal for both superpowers to cut their arsenals by 50%) |

2. *Limiting the kinds of weapons.*
(a) forbidding the use of certain weapons in war—nations attempt to limit the damage a war might cause by outlawing weapons whose effects, especially on civilians, are extremely dangerous. Examples include:

| | | |
|---|---|---|
| 201 B.C. | Rome-Carthage Treaty | (forbade war elephants) |
| 1139 A.D. | Lateran Council Declaration | (prohibited the crossbow) |
| 1899 | Hague Treaties | (prohibited poison gas and bombing) |
| 1925 | Geneva Protocol | (prohibited use of poison gas in war) |

(b) forbidding or limiting the manufacture of weapons—nations attempt to eliminate or control particularly dangerous weapons even during peacetime. Examples include:

| | | |
|---|---|---|
| 1972 | Biological Weapons Treaty | (prohibited manufacture of biological weapons) |
| 1979 | SALT II | (banned the SS-16, limited each side to one new missile type) |



Washington Conference on Disarmament 1921 (National Archives)

(c) limits or bans on testing—a relatively new form of arms control in which nations attempt to reduce the dangers of war and war's destructiveness by controlling the development of new weapons. Examples include:

| | | |
|---|---|---|
| 1963 | Limited Test Ban | (banned atomic testing in the atmosphere, undersea and in space) |
| 1972 | ABM Treaty | (banned testing, production of some anti-ballistic missile components) |
| 1974 | Threshold Test Ban | (forbade underground testing of weapons greater than 150 kilotons) |
| 1979 | SALT II Procotol | (limited testing of certain kinds of cruise missiles) |

3. *Limits on the spread of weapons.*
(a) prohibiting the sale or transfer of certain weapons—nations agree not to sell or give certain weapons to specific countries, or specific groups of countries. Examples include:

| | | |
|---|---|---|
| 1100 B.C. | Israel-Philistines | (limited Israel's use of iron) |
| 1919 | Embargo of China | (restricted arms sales to China) |
| 1950 | Tripartite Declaration | (limited arms sales to the Middle East) |
| 1968 | Non-Proliferation Treaty | (restricted the spread of nuclear weapons) |

(b) demilitarization—nations agree to remove, or restrain armed forces, weapons, and bases within a specific area of land, water or airspace. Examples include:

| | | |
|---|---|---|
| 1817 | Rush-Bagot Agreement | (demilitarized Great Lakes) |
| 1881 | Declaration Demilitarizing the Straits of Magellan | (demilitarized Straits) |

Continued on page 4

Technician at the Hot Line.

| | | |
|---|---|---|
| 1905 | Karlstadt Convention | (demilitarized Norway-Sweden border) |
| 1967 | Latin American Treaty | (denuclearization of Latin America) |
| 1967 | Outer Space Treaty | (demilitarized space) |

4. *Limits on the Conduct of War ("Rules of War")*—nations try to limit the destructiveness of war by agreeing on rules to protect civilians and preserve irreplaceable cultural treasures of value to all mankind. Examples include:

| | | |
|---|---|---|
| 989/1150 | Peace and Truce of God | (established noncombatant status) |
| 1899/1907 | Hague Treaties | (codified cultural treasures) |
| 1935 | Roerich Pact | (protected cultural treasures) |
| 1955 | Hague Convention | (protected cultural treasures) |

5. *Limiting tensions and building confidence.*
(a) improving crisis communication to help prevent accidental war—nations try to set up procedures to insure they will be able to talk to their adversaries and prevent misunderstanding during a time of crisis. Examples include:

| | | |
|---|---|---|
| 1963/1971 | Hotline Agreements | (improved U.S.-Soviet communications) |
| 1971 | Incidents at Sea | (aimed to reduce the risk of nuclear war) |
| 1973 | U.S.-U.S.S.R. Prevention of Nuclear War Agreement | (aimed to reduce risk of war by setting procedures for consultations during a crisis) |

(b) Defusing areas of possible confrontation—nations try to agree that their vital interests are not involved in certain areas. This reduced the chances of confrontations and war. Examples include:

| | | |
|---|---|---|
| 1815 | Declaration of Swiss Neutrality | (neutralized Switzerland) |
| 1955 | Austrian State Treaty | (neutralized Austria) |

As we can see, arms control has been used by nations since ancient times. In the United States, arms control has been pursued since the earliest days of the Republic. The Rush-Bagot Agreement was signed between the U.S. and Great Britain in 1817 (and later joined by Canada). It is one of the oldest arms control agreements still in existence and the forerunner of a long history of U.S. arms control efforts.

While arms control has a long history, both in the U.S. and the rest of the world, it has evolved over the years. Before nuclear weapons, arms control was important, but—if it failed—war could be used to protect national security. Today, however, a nuclear war would be so destructive that any consideration of national interest would become irrelevant. Arms control, therefore, has become much more important. Its fundamental goal is to prevent nuclear war.

The advent of nuclear weapons has also changed the role of military power. Since there could be no winner in a nuclear war, the fundamental goal of military power is the same as that of arms control—to prevent nuclear war. There are other important links between arms control and military power.

*Arms control can limit the size of the military threat to our national security.* Arms control agreements which put ceilings on, or reduce, a potential enemy's forces mean that our military will have a smaller threat to deal with. One of the reasons the Joint Chiefs of Staff (JCS)—America's highest military officers—testified in favor of the SALT I and SALT II Treaties was that they believed the Soviets would obtain more nuclear weapons without these treaties than with them. For example, the SALT II Treaty—which is still not ratified—limited each side to a maximum of ten warheads on each ICBM. Without the Treaty limits, the Soviets could easily put more warheads on their large missiles.

*Arms control can limit the kinds of nuclear threats a nation might face.* In the nuclear age, technological change occurs quickly. If arms control agreements limit testing of new weapons, or prohibit manufacture of them, there is one less threat the military has to worry about. In 1972, the SALT I ABM Treaty limited each side to two anti-ballistic missile sites. This severe restriction on ABMs meant the U.S. military planners did not have to fear that our missiles might not get through.

*Arms control makes it easier for the military to plan for the future.* In a situation where there is no arms control between nations, each nation must assume the worst and plan accordingly. If arms control agreements place limits on each nation's forces, military planners will have a better idea what these forces will look like in the next few years. Instead of having to plan for the worst possible threat, the military can eliminate from consideration those threats which have been avoided by arms control. In 1971, the Joint Chiefs of Staff projected that the Soviets would have 2,000 ICBMs and 1,200 SLBMs by 1977. But the JCS did not have to plan for this threat, because the SALT I agreements limited the Soviets. SALT I kept the Soviets to 1,200 ICBMs and 950 SLBMs by 1977.

*Arms control can help provide the military with more information.* Many arms control agreements have included measures designed to help each party be sure that the other parties are living up to the bargain. (See "verification.") For example, each side might agree not to interfere with the other side's attempts to verify an agreement. Both sides might also agree not to try to hide what they were doing. The net result is that an arms control treaty can make military forces more visible. Thus, General Richard Ellis, then head of the Strategic Air Command, testified in favor of the SALT II Treaty, noting that "under the Treaty it will be easier to verify Soviet actions than it would be without a treaty."

In sum, arms control has been used by nations to strengthen national security since ancient times. In the nuclear age, arms control's role in preventing war has become even more important. Finally, arms control and military force are not opposed to one another. Both have a role in strengthening national security.

> *"Whatever obstacles and disappointments may lie ahead, the world must someday travel to disarmament. For in the nuclear age, armaments no longer offer fundamental security to any nation."*
>
> President John F. Kennedy

# U.S.-Soviet Strategic Competition

Throughout history, there have been many rivalries between powerful nations: in ancient times, Athens vs. Sparta and Rome vs. Carthage, or more recently China vs. Japan, the British Empire vs. Napoleon, and France vs. Germany. Most of these rivalries ended only after one side defeated the other in battle. But in the U.S.-Soviet competition there can be no winner in battle because each side has the ability to destroy the other with nuclear weapons. As a result, the challenge to U.S. national security is to protect American interests while avoiding conflicts that could lead to nuclear war. Though every president since 1945 faced this challenge differently, each has turned to arms control. What follows is the story of why these leaders felt it necessary to build-up, and yet control, the most dangerous weapons in history.

### The Truman Administration 1945-52—Ambivalence

*Attitudes toward nuclear weapons*—President Truman inaugurated the atomic age when he authorized the use of two atomic bombs against the Japanese in 1945—"Little Boy" on Hiroshima and "Fat Man" on Nagasaki. Yet his Administration was ambivalent over the role atomic weapons should play in U.S. national security policy.

The United States and the Soviet Union had been allies during World War II. But the alliance disintegrated in the late 1940's as the Soviets set up puppet regimes in Eastern Europe and began putting pressure on Greece, Turkey, and divided Berlin. Anti-Communism grew rapidly in the United States when it became clear that the Soviet Union constituted the major threat to U.S. national security.

Many in the Truman Administration, including some scientists and a large number of military officials, believed that atomic weapons could play a useful role in the growing struggle with the Soviets. They wanted the U.S. to build a large number of atomic bombs and develop a new, even more powerful "super" weapon, called the hydrogen or thermonuclear bomb. As one senior military advisor said, "It's a fundamental law of defense that you always have to use the most powerful weapons you can produce." These officials also argued that it was important to stay ahead since the Soviets might also develop atomic weapons one day.

Another group of government officials, the most prominent of whom was J. Robert Oppenheimer, the "father of the A-bomb," feared the power of nuclear weapons. Oppenheimer, and many other scientists who had worked on atomic weapons, believed the power of atomic weapons was so great that they could not be used as traditional tools of war. They were even more concerned about the "super" hydrogen bomb, which was far more powerful than the atomic bombs which destroyed Hiroshima and Nagasaki. The Government Advisory Committee of the Atomic Energy Commission, of which Oppenheimer was a member, advised President Truman it was not in the American interest to build the hydrogen bomb. But the worsening international situation weakened the Oppenheimer group's position.

On September 23, 1949, the Soviet Union detonated it's first atomic weapon. Before long, intelligence reports revealed the Russians knew the secret of the hydrogen bomb. Truman felt he had no choice. On January 31, 1950, he took the next major step in the arms race with the statement:

> It is part of my responsibility as Commander-in-Chief of the Armed Forces to see to it that our country is able to defend itself against any possible aggressor.
>
> Accordingly, I have directed the Atomic Energy Commission to continue its work on all forms of atomic weapons, including the so-called hydrogen or super-bomb.

The U.S. successfully tested the hydrogen bomb in 1952, at the end of the Truman Administration. The Soviets tested a hydrogen bomb soon after, in 1953.

By the end of the Truman Administration, the U.S. had 150 bombers capable of delivering atomic bombs. Most of these could not reach the Soviet Union from the U.S. and were based in Europe. The Soviets had only a few bombs, and bombers or other delivery systems capable of reaching the U.S.

### Attitudes towards arms control

While Truman, in the end, came down in favor of the hydrogen bomb and the expansion of the U.S. arsenal, in its early years the Ttruman Administration made a number of attempts at international arms control. Early in his term, Truman appointed Dean Acheson and David Lilienthal to devise a

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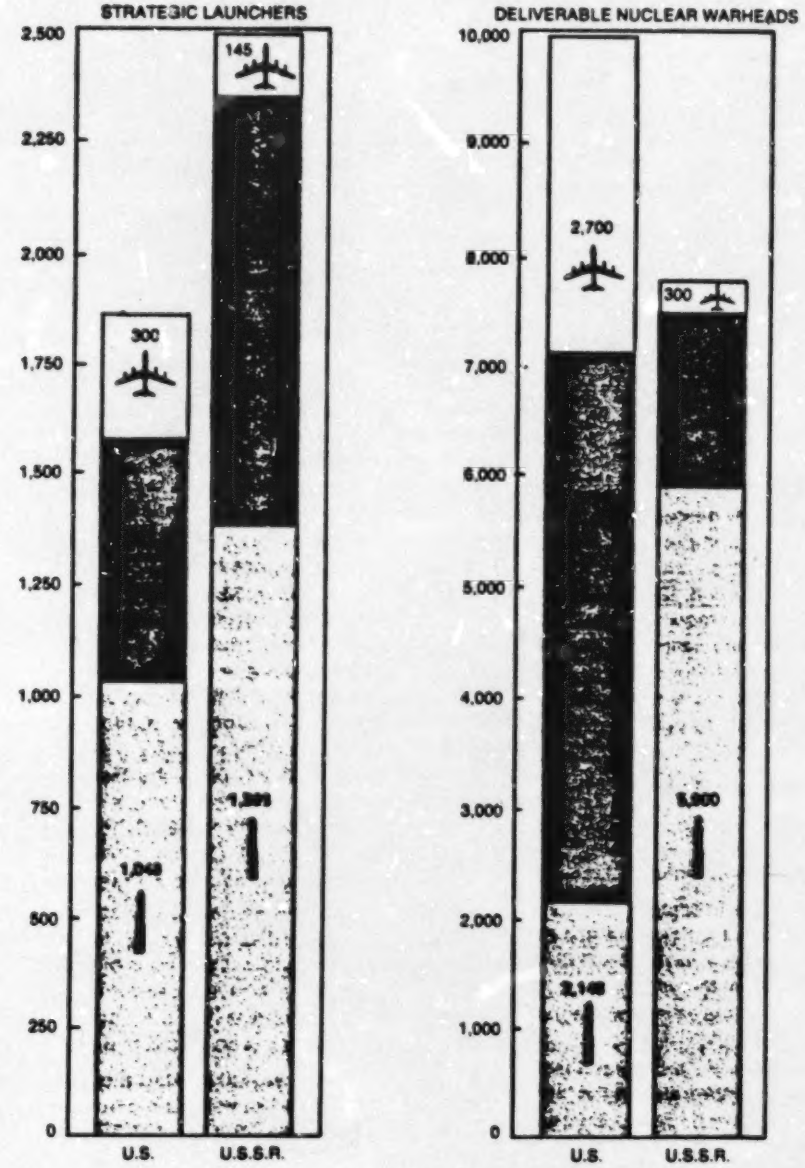
# Strategic Arsenals of the Superpowers

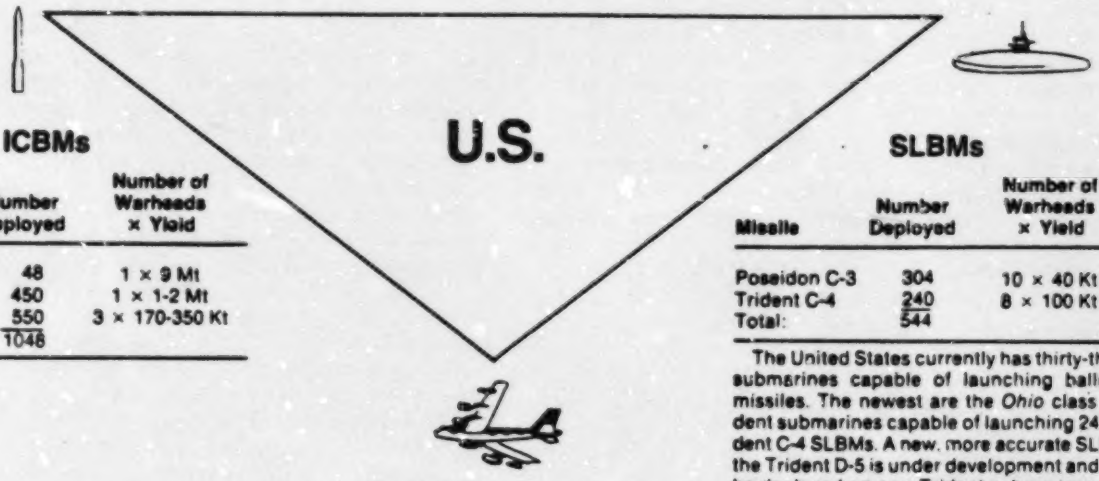



Long-range bombers

Submarine-launched ballistic missiles

Intercontinental ballistic missiles

The strategic forces of the U.S. and U.S.S.R. are represented here in two ways: (*left*) in terms of strategic nuclear delivery systems and (*right*) in terms of deliverable nuclear warheads (bombs and reentry vehicles).



# U.S.

## ICBMs

| Missile | Number Deployed | Number of Warheads x Yield |
|---|---|---|
| Titan II | 48 | 1 x 9 Mt |
| Minuteman II | 450 | 1 x 1-2 Mt |
| Minuteman III | 550 | 3 x 170-350 Kt |
| Total: | 1048 | |

## SLBMs

| Missile | Number Deployed | Number of Warheads x Yield |
|---|---|---|
| Poseidon C-3 | 304 | 10 x 40 Kt |
| Trident C-4 | 240 | 8 x 100 Kt |
| Total: | 544 | |

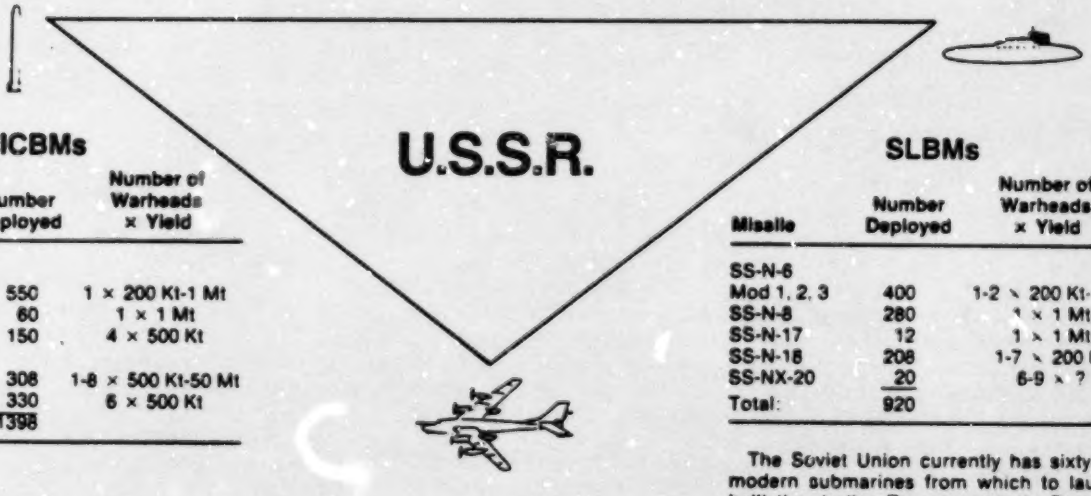
The United States currently has thirty-three submarines capable of launching ballistic missiles. The newest are the *Ohio* class Trident submarines capable of launching 24 Trident C-4 SLBMs. A new, more accurate SLBM, the Trident D-5 is under development and will be deployed on new Trident submarines

## Long Range Bombers

| Bomber | Number Deployed |
|---|---|
| B-52 | Mod C through H 300 |

The B-52 is capable of delivering a mix of gravitational nuclear bombs and nuclear tipped Short Range Attack Missiles (SRAMs). Starting in 1982, B-52s will be modified to carry Air Launch Cruise Missiles (ALCMs).

# *Weapons and Capabilities*



# U.S.S.R.

## ICBMs

| Missile | Number Deployed | Number of Warheads x Yield |
|---|---|---|
| SS-11 | | |
| Mod 1, 2, 3 | 550 | 1 x 200 Kt-1 Mt |
| SS-13 | 60 | 1 x 1 Mt |
| SS-17 | 150 | 4 x 500 Kt |
| SS-18 | | |
| Mod 1 to 4 | 308 | 1-8 x 500 Kt-50 Mt |
| SS-19 | 330 | 6 x 500 Kt |
| Total: | 1398 | |

## SLBMs

| Missile | Number Deployed | Number of Warheads x Yield |
|---|---|---|
| SS-N-6 | | |
| Mod 1, 2, 3 | 400 | 1-2 x 200 Kt-1 Mt |
| SS-N-8 | 280 | 1 x 1 Mt |
| SS-N-17 | 12 | 1 x 1 Mt |
| SS-N-18 | 208 | 1-7 x 200 Kt |
| SS-NX-20 | 20 | 6-9 x ? |
| Total: | 920 | |

The Soviet Union currently has sixty-two modern submarines from which to launch ballistic missiles. The newest is the Typhoon class submarine. The Typhoon carries the SS-NX-20, which along with the SS-N-18, represent the most modern generation of Soviet SLBMs. The Soviets now have operational 26 Yankee, 35 Delta and one Typhoon submarine.

## Long Range Bombers

| Bomber | Number Deployed |
|---|---|
| Tu 95 Bear | 105 |
| MVA 4 Bison | 45 |

From page 5

plan that could end the use of atomic energy for war. The Acheson-Lilienthal Report was delivered in large part before the United Nations on June 14, 1946 by Bernard Baruch, and subsequently became known as the Baruch Plan.

The Baruch Plan called for the United States to destroy its atomic weapons after an international agency was established to monitor the peaceful uses of atomic energy. In Baruch's words, "If we fail, then we have damned every man to be the slave of Fear. Let us not deceive ourselves: We must elect World Peace or World Destruction."

The American offer was unprecedented. But five days later, Andrei Gromyko presented an alternative plan on behalf of the Soviet Union. The Soviet plan differed from the Baruch Plan in one key respect: the United States must destroy its weapons *before* an international agency was established, not after. It was clear the Soviet Union did not want to give up the opportunity to produce atomic weapons while the United States still possessed them.

This deadlock was not broken even though negotiations continued at the United Nations. (The Soviet detonation in 1949 came as no surprise and did not slow negotiations.) But the onset of the Cold War doomed early hopes for arms control.

**The Eisenhower Administration 1952-1960—Nuclear Superiority**

*Attitudes toward nuclear weapons*—Unlike the ambivalence that characterized the Truman Administration's attitudes on nuclear weapons, the Eisenhower Administration came to power believing in nuclear superiority. From the start, nuclear weapons were given a major military and foreign policy role.

When Eisenhower came to office the Cold War was at its height. The United States was fighting a war in Korea and faced growing threats from the Soviet Union in Europe and around the world. At the same time, the Eisenhower Administration believed strongly that a balanced budget was necessary for a strong U.S. economy. A balanced budget required cuts in defense spending. The solution was to cut back the size of the US Army and Navy and rely more heavily on nuclear weapons, which were relatively cheap.

In 1954, Eisenhower's Secretary of State, John Foster Dulles, announced the policy of "massive retaliation," which formally set out the Administration's heavy reliance on nuclear weapons.

While some aspects of the policy were left unclear, it seemed to mean that the U.S. would react to aggression by launching a full-scale *nuclear*, not conventional attack against the

# Warfighting and Deterrence: Brodie vs. Kahn

DOONESBURY
by Garry Trudeau
GOOD MORNING, AL... AND WELCOME TO THE WAR-GAMES WE SHALL BE REFIGHTING TO DEMONSTRATE SHALLOWNESS OF NUCLEAR CONFRONTATION. THE RUSSIAN B HOSTILE FORCES STAND BY FOR INVASION.
EACH OF YOU HAS BEEN ASSIGNED A PLACE IN THE CHAIN OF COMMAND AS THE CRISIS GROWS YOU MUST USE YOUR CODE BOOKS TO RELAY ORDERS TO YOUR STRATEGIC FORCES.
AS APPROPRIATELY IS SECRETED, THE PRESIDENT WILL APPEAR ON YOUR DISPLAYS. IF AT ANY TIME YOU WISH TO TRY TO RESOLVE THE CRISIS THROUGH QUIET DIPLOMACY, SIMPLY PRESS THE CLEAR BUTTON.
READY? LET THE GAMES BEGIN!
CODE RED? CODE... UH... NEVER MIND. JUST A FLOCK OF GEESE.
GBTrudeau

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Men have argued about how to use nuclear weapons almost since they were invented. Although the weapons themselves and the bombers, missiles and submarines which carry them, have changed greatly over the years, the basic issues in the nuclear debate have remained pretty much the same. We can better understand these issues by looking at the contrasting ideas of two of the most influential nuclear war theorists—Bernard Brodie and Herman Kahn.

The late Bernard Brodie began his professional life before World War II by writing several well-received books on naval strategy. He turned to analyzing nuclear warfare after 1945, first at Yale, then in California at the RAND Corporation and at UCLA. Herman Kahn first studied physics and turned to strategy when he joined RAND in 1948. He later founded the Hudson Institute think tank and is still a consultant on strategic and other international relations issues.

Perhaps the best way to introduce the key ideas of these men is to imagine a debate, between a student of Kahn's and one of Brodie's, on the question: How can nuclear weapons be used to strengthen our national security?

*Brodie's student:* Nuclear weapons have changed war in a fundamental way. They have made victory in a general war impossible. Therefore, the only purpose of nuclear weapons is to prevent a war, not to win one.

*Kahn's student:* I disagree. While nuclear weapons have changed some aspects of war, they have not changed the fundamentals. The purpose of nuclear weapons is the purpose of all weapons: to fight a war and to win.

*B.:* You're overlooking some basic facts. Men do not fight wars just for the sake of fighting. They fight for political objectives, like the protection of their governmental system, or an increase in their nation's power. If the costs of war outweigh these political objectives, then war is senseless.

*Kahn:* Exactly my point. We have to use nuclear weapons to ensure that after a war, we're better off than our enemies.

*B.:* But what does "better off" mean? Nuclear weapons are relatively cheap, so great powers can easily get thousands of them. They are also tremendously powerful as we saw at Hiroshima and Nagasaki. In a nuclear war, even if only a small percentage—say just one percent—of the nuclear bombs reach their targets, hundreds of cities and millions of people would be destroyed.

*K.:* But if we could do more damage to the Soviets . . .

*B.:* Just a second. In any nuclear war, the costs to *both* sides would be so high they would make *any* political objective worthless. Neither side would "win" in any valid sense of the word.

aggressor's homeland. In fact, the U.S. threatened to use nuclear weapons during the Korean War, the Taiwan crises of 1954 and 1955, and the Berlin crisis of 1958.

Moreover, under Eisenhower, the U.S. increased its numbers of bombers from 150 to 540, built 12 intercontinental ballistic missiles (ICBMs) and put to sea three Polaris submarines. The development of ICBMs was an American "first" that gave a new quality to strategic warfare. It brought the Soviet Union within thirty minutes' reach of a push of the button.

By the end of the Eisenhower Administration, the U.S. had about 4,400 strategic nuclear weapons. The Soviets, who had no intercontinental bombers, submarine-launched missiles, or ICBMs in 1952 had about 150 bombers and 4 ICBMs in 1960. The number of their strategic nuclear weapons, 300, was still a fraction of the U.S.'s.

Despite the American superiority, the U.S. feared the growth of Soviet nuclear arsenals, especially after the 1957 Sputnik launch indicated Soviet ability to develop ICBMs. At the same time, nuclear superiority did not prevent international events from getting out of U.S. control. The Soviets moved into Hungary in 1956, left-wing insurgent movements sprang up worldwide, and the Middle East was in turmoil. Protection of U.S. national security interests required diplomacy as well as military clout.

*Attitudes toward arms control*—Although the Eisenhower Administration relied heavily on nuclear weapons, President Eisenhower himself, and some of the men around him, realized how dangerous nuclear weapons were and made efforts to limit them. In 1953, President Eisenhower announced the "Atoms for Peace" proposal for sharing nuclear technology for peaceful purposes. His plan led to the creation of the International Atomic Energy Agency (IAEA).

In the same year, Joseph Stalin died and a new "thaw" in the Cold War resulted, permitting greater attention to arms negotiation. President Eisenhower called for aerial inspection of Soviet and American territory in his 1955 "Open Skies" address. In 1958, negotiations began banning nuclear tests. In 1959, agreement was reached on a treaty demilitarizing Antarctica. Perhaps the most important sign of President

*Continued on page 10*

*"Our nuclear capabilities have increased to staggering proportions, disarmament has become, literally, a problem of survival for all mankind."*

*President Dwight Eisenhower*

*K.*: Look, I'll grant you that nuclear war would be an unprecedented catastrophe. But it would not mean the end of civilization. In fact, if we—or the Soviets—took proper precautions, like civil defense, and used our weapons right, it would be possible to recover in a relatively short time.

So, in a nuclear war, one side can come out better than the other, just like in any other kind of war. The side that comes out better will win.

*B.*: First, you're drastically underestimating the damage a nuclear war would do. Second, the purpose of war is not just to do more damage to the other guy. What's the point of killing 100 million of the enemy if he kills 90 million of us? What political objective would be worth such a mind-numbing loss? That's the question you are overlooking.

*K.*: Let's get at this another way. If you don't believe nuclear weapons should be used to fight and win a nuclear war, how should they be used? Should we just toss them away?

*B.*: No. They should be used to prevent a nuclear war through "deterrence." We have to convince a potential attacker that the costs of an attack far outweigh the gains. We have to ensure that after any possible Soviet attack, enough of our bombers and missiles could survive to devastate the Soviets. If we had such a survivable force, the Soviets would have nothing to gain from an attack and nuclear war would be deterred.

*K.*: Doesn't that mean we need more nuclear forces than our enemy?

*B.*: Not necessarily. The key is survivability. A relatively small number of bombers and missiles—as long as they could survive and get through—would be enough to devastate our attacker. That would scare him off from attacking us in the first place.

*K.*: We really disagree here. To fight and win a nuclear war, we need large numbers of nuclear weapons. Not only that, we should use our weapons to destroy the enemy's weapons, knock out his bombers, missiles and submarines. Once we've done that we can force him to surrender.

*B.*: Wrong. For deterrence, our bombs should be aimed at the enemy's cities, not at his missiles and bombers. As Brodie said, a potential attacker "cares more for his cities intrinsically than he does for a few airfields." If we want to frighten him off, he has to know his cities are in danger.

*K.*: You know, I worry about what happens if deterrence fails. If a nuclear war breaks out, your strategy would mean we'd be killing innocent civilians.

*B.*: I worry that if we follow your strategy of preparing to fight or win a nuclear war instead of deterring it, we may make a nuclear war more likely.

DOONESBURY by Garry Trudeau

OKAY, HERE'S THE SCENARIO. IT'S DAY ONE. BOTH SUPERPOWERS ARE MOBILIZING. SOVIET TROOPS ARE MASSING ON THE GERMAN BORDER. HMC, WHAT IS YOUR RESPONSE AS CHAIRMAN OF THE JOINT CHIEFS?
I'M PUTTING MY TACTICAL NUCLEAR WEAPONS ON FULL ALERT AS PER PRESIDENT REAGAN'S ORDERS!
BOOP! MR. PRESIDENT, WHAT IS YOUR POSITION?
I'M OUT RIDING BUT I'M MISSING MY BRIDGE
UH-OH! THE SOVIETS HAVE JUST HIRED A FOUND OF HEAVY GUNS INTO A FOR-WARD UNIT!
COULD BE A MISTAKE. REMEMBER, TENSIONS ARE VERY HIGH!
BEGINNING TO BE CARIBOU, MIKE!
NO! YOU'RE OVER-REACTING! IT'S JUST A BORDER INCIDENT!
IT'S A TRAP! I'M GOING NUCLEAR!
WHAT'S ALL THESE CUTE LITTLE MUSHROOMS?

Eisenhower's interest in arms control was his creation of a cabinet-level arms negotiator in 1955. But by 1960 when he left office, Eisenhower was clearly disappointed by the lack of real accomplishment in arms control. In 1953, the Cold War consistently kept the lid on progress.

In his farewell words to the nation, Eisenhower said:

> As one who has witnessed the horror and the lingering sadness of war—as one who knows that another war could utterly destroy this civilization which has been so slowly and painfully built over thousands of years—I wish I could say tonight that a lasting peace is in sight.

### The Kennedy-Johnson Administrations, 1960-68—Nuclear Credibility

*Attitudes toward nuclear weapons*—President Kennedy cast aside the Eisenhower Administration's faith in nuclear superiority and instead strove for *credibility* in the structure and purpose of U.S. nuclear forces. Kennedy defense officials felt the Eisenhower policy of all-out nuclear retaliation was not credible because it invited nuclear war and did not account for the rapidly growing Soviet nuclear arsenal.

At the same time, the Kennedy Administration saw the U.S.-Soviet competition in more than just nuclear terms. Nuclear weapons could not turn the tide of Soviet-sponsored uprisings in the third world; conventional weapons and economic assistance would be Kennedy's answer.

The "massive retaliation" doctrine was replaced by "flexible response." Instead of answering aggressors with an all-out nuclear attack, as Eisenhower advocated, the new Kennedy's policy gave the military greater flexibility in their choice of response. To allow for more nonnuclear choices, the Kennedy Administration built up conventional armed forces by 200,000 men and added more ships, planes and tanks.

But if nuclear war was inevitable, Kennedy also wanted a choice other than all-out destruction. His Secretary of Defense, Robert McNamara, proposed in 1962 that the U.S. could have a "controlled response" to a Soviet nuclear attack by hitting Soviet nuclear forces and not cities. The Kennedy Administration viewed this "no-cities" doctrine as an alternative to threatening all-out retaliation on the USSR. Moreover, this doctrine could limit damage to the United States if a nuclear war broke out. Critics, however, saw the proposal as a dangerous move to nuclear war-fighting, reflecting the ideas of Herman Kahn and others who believed a nuclear war was "winnable" (see box).

As early as 1963 McNamara began to share the critics' doubts. He gradually came to recognize that it would not be possible to "contain" or "limit" damage in any meaningful way, as Soviet forces grew more powerful.

By 1964, when Lyndon Johnson was elected President, McNamara established deterrence as the central purpose of U.S. nuclear forces. Deterrence meant nuclear weapons would *prevent* nuclear war, not fight and win one, by threatening an attacker's homeland with "assured destruction."

To assure the enemy's destruction, McNamara structured U.S. forces on a "triad" of land, sea and air legs. If a Soviet strike damaged one or two legs, another could survive to retaliate. The TRIAD is still the basic structure of our nuclear forces today.

McNamara's next task was to determine how large the surviving forces must be in order to inflict "unacceptable damage" to the Soviet homeland in a retaliatory, or second strike. He calculated that 400 one-megaton bombs could cause enough damage to deter the Soviets.

President Kennedy's national security Executive Committee meets during the Cuban missile crisis. (John F. Kennedy Library)

The TRIAD and the deterrence logic behind it served another purpose. In the late 1950s, U.S. intelligence about the Soviets was limited. One result was the U.S. intelligence agencies erroneously reported that the Soviets were about to pass the U.S. in numbers of ICBMs. John Kennedy used these reports in his 1960 campaign, claiming a "missile gap." By 1961 high-flying aircraft and new satellite reconnaisance technology revealed that Soviet intercontinental nuclear forces, in fact, were vastly inferior to American forces. But Kennedy had already begun a huge strategic build-up. Now, McNamara's task was to scale back the fast-moving production lines. By placing nuclear forces on a rational footing, the deterrence strategy accomplished this.

Therefore, though the ICBM force leapt from 12 to 1,054 in the Kennedy-Johnson years, they would have gone much higher, perhaps to two or three thousand. In addition, the strategic bomber force increased from 540 to 560, and missiles launched from submarines rose from 48 to 656.

Soviet forces during the period grew too, although they remained much smaller than U.S. forces. From a few ICBMs in 1960, the force grew to 1,050 in 1968. Missiles launched from submarines went from 48 in 1960 to 160 in 1968. The number of bombers, 155, remained about the same.

*Attitudes toward arms control*—When Kennedy came to office in 1960, U.S.-Soviet tensions were running high. The American fiasco in the Bay of Pigs, the resumption of Soviet nuclear testing after a three-year moratorium, and the unfortunate Kennedy-Khrushchev meeting at the Vienna Summit all set the stage for confrontation.

Then, in 1962, the Cuban Missile Crisis brought the world to the brink of nuclear disaster. For thirteen days the world watched the stand-off between Soviet Party Chairman Khrushchev's resolve to put nuclear weapons in Cuba and President Kennedy's equal determination not to let him. American school children learned where nearby civil defense shelters were in preparation for disaster.

Kennedy's clever, "face-saving" solution succeeded in keeping nuclear-tipped missiles out of Cuba, without requiring a Soviet "surrender."

The Cuban missile crisis showed both superpowers how dangerous the nuclear arms race could be. As a result, both became receptive to efforts to limit nuclear weapons.

In 1963, agreements were signed between the U.S. and the Soviet Union that limited nuclear testing (the Limited Test Ban Treaty) and set up the Hotline to improve communication between the superpowers in a crisis. In 1967, a Treaty was signed banning nuclear weapons in outer space, and the next year the superpowers signed the Non-Proliferation Treaty which aimed to slow the spread of nuclear weapons.

Finally, in 1967, President Johnson made the first approaches to the Soviets about beginning negotiations which would limit nuclear weapons. Johnson's efforts faltered when the Soviets invaded Czechoslovakia in 1968. It would take the commitment of a conservative Republican, Richard Nixon, to forge a lasting strategic arms agreement with America's long-standing ideological enemy.

### The Nixon-Ford-Carter Administrations, 1969-1980—Nuclear Parity

*Attitudes toward nuclear weapons*—Since the Soviet nuclear force had "grown up" to a level roughly equal to American forces, the key word of the 1970s was *parity*. The roughly equal balance colored attitudes towards arms and arms control in three successive Administrations.

In 1964 President Johnson had to worry about 200 Soviet ICBMs. President Nixon faced 800. By the time Ford was in office, in 1976, the Soviet count reached 1,549. During the same period, Soviet submarine-launched missiles increased from 150 to 826. Bomber numbers stayed about the same, at 160.

During the same period, nuclear launch vehicles in the United States actually declined somewhat, from a total of 2,356 to 2,106, due to retiring older aircraft. However, a great leap in U.S. power did occur in the number of nuclear warheads, or weapons, because of the new MIRV technology. MIRV, for Multiple Independently-Targetable Re-entry Vehicle, meant that each missile could carry several warheads, each of which could destroy a separate target. Thus, while the number of missiles remained about the same, the number of U.S. ICBM and SLBM warheads grew from less than 2,000 to about 9,000. Much later in the decade, the Soviet Union also mastered the MIRV. As a result, their warhead arsenal went from 1100 in 1968 to 3300 in 1976 to approximately 8000 today.

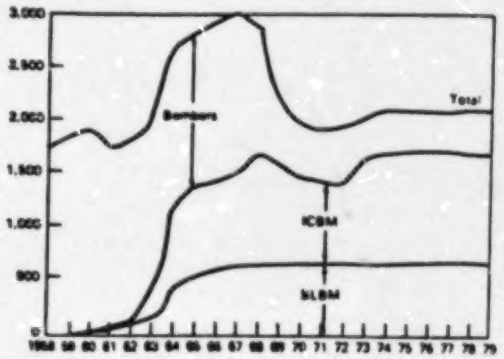
President Nixon recognized that at these levels of nuclear weapons, "nuclear superiority" was impossible to achieve and meaningless as a concept. Therefore, he accepted the fact that Soviet forces would always be roughly equal to, or at parity with, U.S. forces.

But Nixon and his National Security Advisor Henry Kissinger did not share Kennedy's view that nuclear weapons should play a minimal foreign policy role. The defeat of American conventional forces in Vietnam led Nixon and Kissinger to remind the world that the U.S. still had the nuclear option. In the Arab-Israeli war in 1973, Nixon used nuclear threats to keep the Soviets out of the conflict.

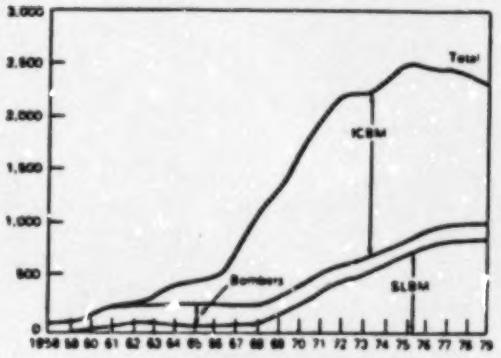
In addition to bringing nuclear weapons "out of the closet," the Nixon-Ford Administrations rejected McNamara's "assured destruction" doctrine because it did not give the President enough nuclear option. Instead, in 1973, Nixon's newly-appointed Secretary of Defense, James Schlesinger, announced a change in the U.S.'s strategic doctrine. He said that fewer U.S. nuclear forces would be aimed just at cities, more would be aimed at Soviet missiles, bombers and submarines. Like McNamara in 1962, Schlesinger argued this could limit damage to the U.S. and perhaps allow the U.S. to cope better with nuclear war than the Soviets.

Schlesinger based his notion that nuclear wars could be limited and perhaps won on the greater accuracy and numbers of nuclear weapons. As part of his war-fighting program, he gave the go-ahead for design studies of the MX, a powerful and accurate 10-warhead missile.

**THE GROWTH OF THE ARSENALS 1958-1980**
**(Delivery Vehicles)**




Soviet Strategic Forces




Source: "Deterrence in the 1990's. Part I American Strategic Forces and Extended Deterrence," Anthony Cordesman, *Adelphi Paper* 175.

President Carter did not retreat from the war-fighting ideas, but endorsed them in what is known as "P.D. 59" (or Presidential Directive 59). Leaked during the 1980 campaign, the doctrine foresees prolonged nuclear battles as well as selective use of nuclear weapons in such areas as the Middle East. Carter also supported a 200-missile MX force.

*Attitudes toward arms control*—Recognition of parity opened the way for an "era of negotiation." In the key negotiation of the period, SALT, or Strategic Arms Limitation Talks, the goal of the Nixon-Ford and Carter Administrations was to achieve and maintain a relative balance in superpower forces from which gradual reductions could be made. The SALT I and II agreements, signed in 1972 and 1979, accom-

Continued on page 12

plished this goal. In light of two previous decades of limited attempts to control aspects of the arms race, these treaties were the most ambitious of the nuclear era. In addition, the SALT I agreement on limitation of Anti-Ballistic Missiles (ABMs) was the first time countries agreed to forego a new military technology.

The era of negotiation came at a time of generally warmer or "detente"-style superpower relations that all three Administrations fostered. At the beginning of Nixon's tenure in 1968, relations were at a low ebb as a result of American involvement in the Vietnam War and the Soviet invasion of Czechoslovakia. But the Nixon-Kissinger theory of detente was to improve relations by involving the Soviets in the maintenance of a stable world order. If the Soviets had a stake in a web of economic and strategic agreements, Soviet attempts at world domination would be held in check. The SALT agreements by implication thus added a distinctly new political feature to arms control. Throughout the decade, despite various ups and downs in relations, SALT talks remained high on the superpower agenda.

### The Reagan Administration—Perceptions of Vulnerability

*Attitudes toward nuclear weapons*—The key phrase to describe Reagan Administration views on both nuclear arms and arms control is "perception of vulnerability." During the election campaign, Ronald Reagan charged that in the seventies U.S. nuclear forces had fallen behind the Soviet nuclear forces. As a result, American land-based missiles would be vulnerable to a Soviet first-strike and the Soviets might gain a tool to blackmail America for political purposes.

To restore American nuclear strength and overcome this perceived American vulnerability, President Reagan proposed a $180 billion, five-year strategic modernization program in October 1981. This build-up will add 7,000 new weapons to the U.S. stockpile over ten years. Reagan repeated

# What's Behind the Soviet Build-up?

After World War II, Joseph Stalin had two problems. One was to stop American influence in Western Europe, and especially in Germany, from moving eastward. The second was to hide Soviet economic and military weakness until an answer could be found to the American atomic bomb. At heart, he feared the Germans and distrusted the Americans.

Stalin's solution was to keep the Red Army in Eastern Europe after the war. The Army could give the appearance of strength, provide an insurance policy against Eastern European hostility, and keep Western Europe hostage to American behavior. But the most important part of the strategy was to keep the West divided and guessing about Soviet intentions. The USSR needed to rebuild and prepare industrially for the "inevitable war" between capitalism and socialism.

But Stalin's strategy failed miserably. The West interpreted Soviet actions as an intent to march to the English Channel. Instead of breaking Western unity, Stalin prompted new solidarity, symbolized by the formation of the North Atlantic Treaty Organization (NATO). Instead of encouraging American restraint with a show of strength, the United States pushed for the hydrogen bomb.

Matters got worse during the Korean War. As the war ended near Stalin's death, a frightening strategic situation emerged: America was committed to global "containment" of communist influence; China bitterly denounced the Soviet model; and a strengthened Germany formed the front line of Western European defense. Like always, the Soviet Union felt encircled by enemies.

On top of everything, Stalin's death panicked the leadership. Who would make the decisions? In the debate that ensued over future Soviet policies, the moderates eventually won. Led by Georgi Malenkov and Nikita Khrushchev, they determined to end Stalinism forever.

As part of this effort, Khrushchev dramatically changed Soviet thinking on nuclear weapons and foreign policy. Though the USSR was catching up to the American nuclear force, one reality haunted him: the Americans could reach Soviet territory with nuclear weapons in a scant 24 hours' notice, but the Soviet Union could not deliver nuclear weapons on American territory. Nuclear war through "surprise attack" became the key Soviet concern of the 1950s.

Khrushchev dealt with this concern in a number of ways. First, he encouraged a superpower "thaw" by declaring "peaceful coexistence" could be a long-run basis for U.S.-Soviet relations. This lead to the first serious Soviet arms control overtures, such as the Comprehensive Proposal in 1955 for "ground control posts" to detect movements toward suprise nuclear attack.

Second, Khrushchev continued Soviet development of intercontinental ballistic missiles and pressed ahead with an elaborate system of air defenses.

But the most spectacular change was Khrushchev's revision of Lenin's war doctrine. In 1956, Khrushchev said war would no longer be inevitable between the socialist and capitalist camps. The strength of the Soviet military and the utter destructive potential of nuclear weapons would keep the West from waging war with the Soviet Union. For the first time, it seemed, the Soviets saw the impact of nuclear weapons and explained it to their people. From the 1950s onward, the basic Soviet policy was set: keep a credible military deter-

**Missile/Bomber Bases in the United States**

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the pledge to deploy the MX missile, although he cut the force in half to 100 missiles.

The Reagan Administration also continued the doctrine that nuclear weapons can be used in war. As his Secretary of the Air Force, Verne Orr, told an audience in January 1982: "The nuclear element (of Reagan's defense strategy) emphasizes the development of a credible deterrent, composed of survivable strategic forces possessing a war-fighting capability."

The Reagan Administration thus carries forward the idea of the seventies that nuclear weapons can have political and military value beyond deterrence. This is in sharp contrast to the McNamara period in the sixties, when nuclear forces were calculated according to the single mission of *deterring* nuclear war. The broader mission means that the development of nuclear weapons will remain an important measure of U.S. power.

*Attitudes toward arms control*—The perception of American force vulnerability is also the key to President Reagan's attitudes on arms control. At first, the Reagan Administration resisted efforts to begin arms control negotiations. But under the pressure of public demands to slow the arms race, President Reagan proposed that negotiations seek deep cuts in strategic forces rather than gradual reductions. Hence he adopted the acronym START, for Strategic Arms Reduction Talks. Reagan's opening bid for START negotiations, announced in May 1982 at Eureka College, calls for each side to reduce its number of ICBMs and SLBMs to 850, and its ICBM and SLBM warheads to 5,000. No more than half of these missiles or warheads could be based on land.

The aim of the proposal is to reduce the vulnerability of American forces primarily by curtailing both Soviet and American ICBMs. The Reagan proposal says nothing about reducing bombers or America's new cruise missile technology. Thus, in an overall sense, the U.S. will be permitted to

Continued on page 16

rent, and the irrational class enemies would behave.

However, in 1962, the Cuban Missile Crisis exposed Soviet nuclear inferiority, masked since Stalin's day behind bluff and bluster. Khrushchev had tried to enhance a weak strategic posture by putting missiles in Cuba, a new-found friend conveniently close to the United States. When President Kennedy forced him to back down, Soviet leaders vowed they would never be so weak again that the United States could dictate their policy.

The embarrassment of Khrushchev's gamble led to his downfall in 1964. The Brezhnev era began with renewed commitment to build Soviet strategic forces.

This dedication brought the Soviets to a long-sought position of rough parity with the United States. The ten-year modernization program hit a peak just as the SALT I agreements were signed in 1972. For the Soviets, it was a crowning achievement: they now felt the political as well as military equal of the United States.

In addition to the strategic treaties, the United States and Soviet Union signed several agreements concerning trade, technology and scientific affairs. The Soviet Union began to appreciate the opportunities of detente. Collaboration could bring across-the-board benefits for both nations, even while ideological competition quietly continued.

But the strategic agreements were not without drawbacks for the USSR. The Chinese had become increasingly troublesome, forcing the Soviets to triple their ground forces along the Sino-Soviet border between 1968 and 1972. Then President Nixon went to China, and a specter of two powerful enemies emerged. The SALT I agreement to limit anti-ballistic missiles (ABMs) added to Soviet anxieties because it left the USSR open to attack from Chinese nuclear missiles.

Another problem with SALT I from the Soviet viewpoint was that it left a critical loophole in US favor: MIRV technology. The Soviet Union was far behind this American lead, which held the possibility of multiplying U.S. power through the 1970s. To prevent that from occurring, the Soviets redoubled their efforts to keep pace and not lose the precious international recognition of being equal to the U.S. in military power.

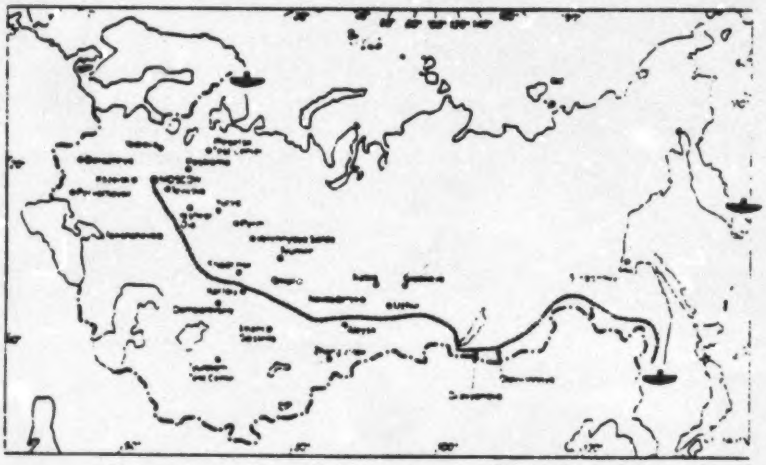
That effort bore fruit in 1977 when the Soviets began MIRVing, or putting multiple warheads, on their giant land-based missiles. Giant or "heavy" missiles were a Soviet specialty only by default. Their missiles were bigger than American ones because they lacked the skill to make them small and accurate.

MIRVing the giant missiles gave the Soviets tremendous power on land. To their mind, this was reassuring compensation for their noisy submarine force and inadequate strategic bombers.

By 1979, these and American forces were capped in the SALT II Treaty, signed in Vienna by President Carter and Chairman Brezhnev. But the era of SALT came to an end as the Soviets invaded Afghanistan at the end of the year.

After dark days in U.S.-Soviet relations caused by Afghanistan, a renewed interest in arms control is apparent in both countries. The Soviet build-up of the mid-seventies seems complete, while the U.S. is on the verge of a new round of modernization. If the commitment of the early 1970s can be repeated, opportunities for serious negotiating are good.

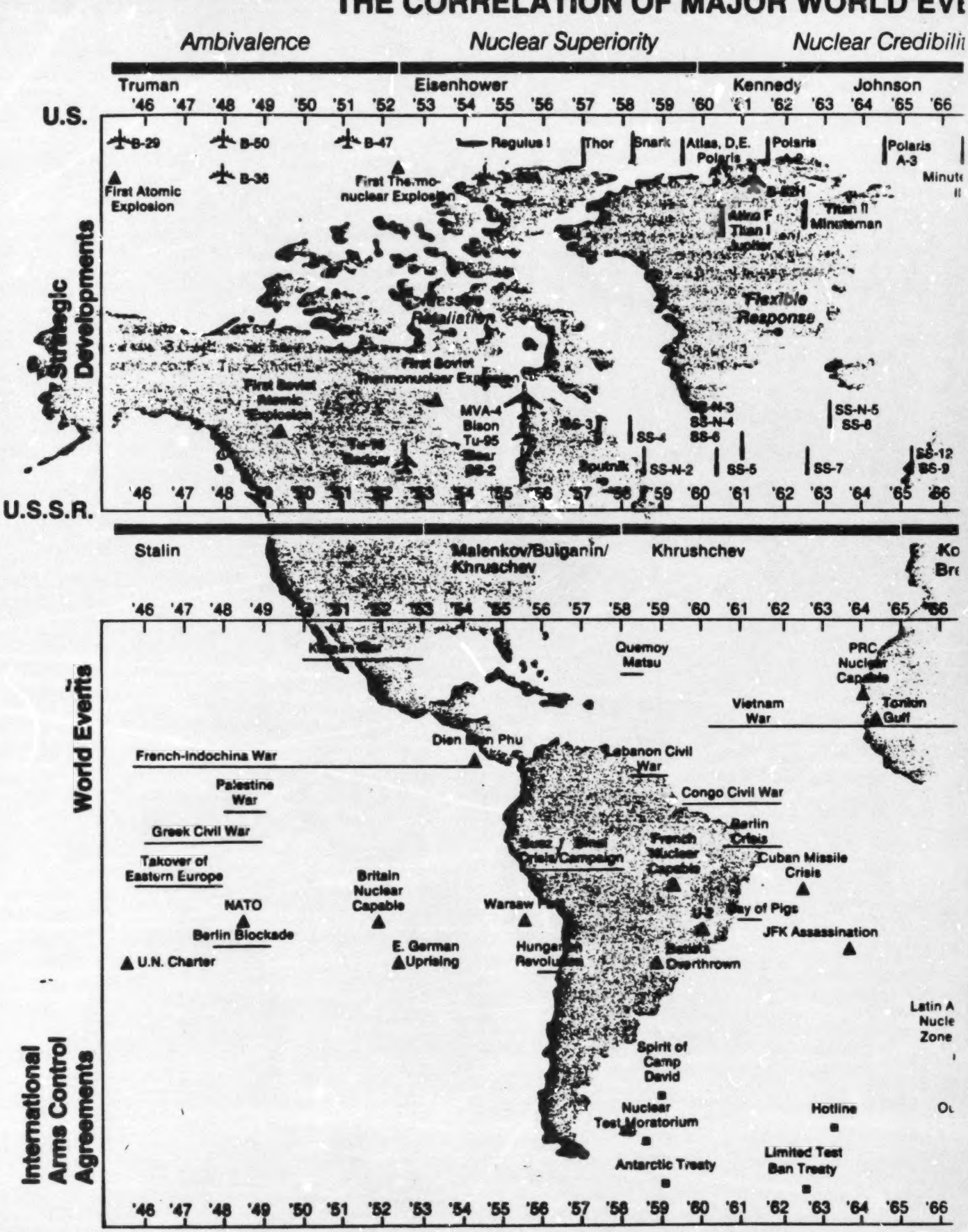
**Missile Bases in the USSR**



• Soviet ICBM deployment
▬ Soviet SSBN bases

Source: Desmond Ball, *Survival* July/August 1980

# THE CORRELATION OF MAJOR WORLD EVI



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# ITS & U.S.—U.S.S.R. STRATEGIC COMPETITION

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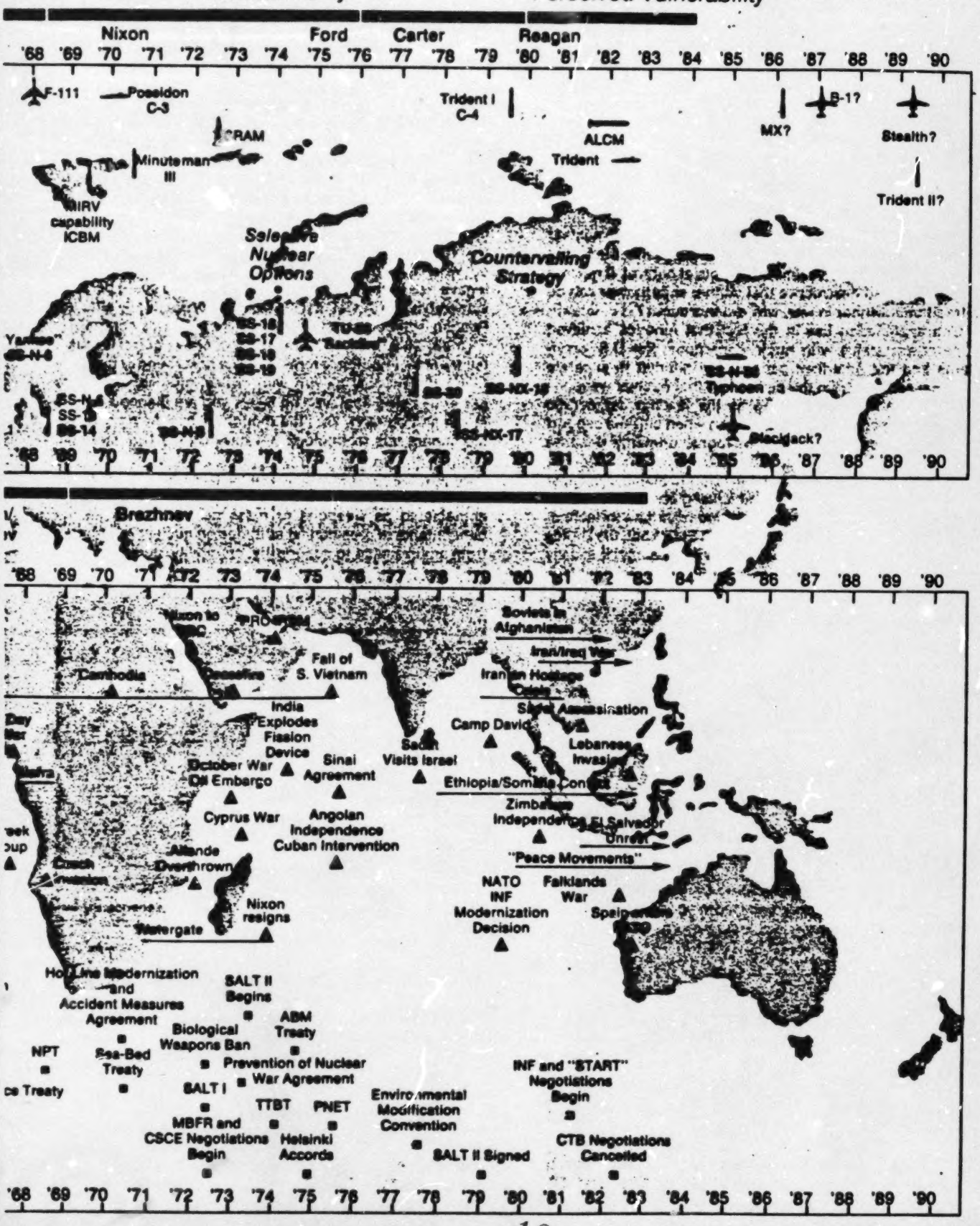


expand and modernize its nuclear forces. However, if President Reagan's START proposal succeeds, it will be the first time cuts of such magnitude are negotiated on part of the superpower arsenals.

Previously, the SALT II Treaty required a ten-percent reduction of Soviet launchers, to bring them into balance with U.S. launchers. The Reagan Administration will not ask for Senate ratification of the SALT II Treaty but has pledged not to undercut it, so long as the Soviet Union does likewise.

**Conclusions: A History of Competition and Control**

After a quick glance at the American history of nuclear weapons development, it is easy to conclude that the forces for competition overwhelmed attempts at control. If nuclear weapons are so destructive that neither superpower can be a traditional winner in war, why did this occur?

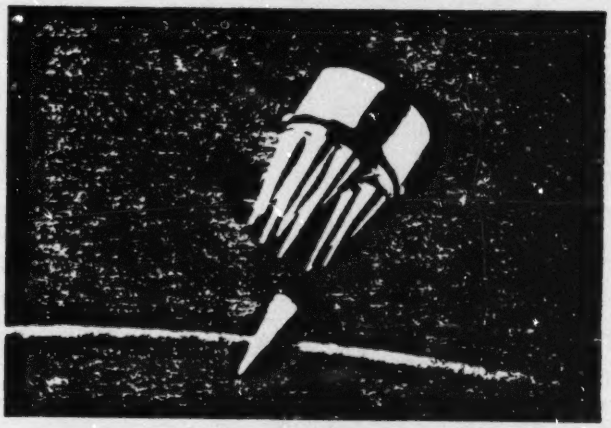
One explanation lies in the fact that America achieved superpower status with nuclear weapons. For U.S. presidents and the American people, it is difficult to separate national security from the perception that nuclear weapons guarantee American standing as the leading democratic power. This perception remains even when citizens support the need to control nuclear weapons, primarily because Americans want to keep the U.S. as strong as, if not stronger than, the Soviet Union. The Soviet effort to match U.S. capabilities is a powerful inducement to keep competing.

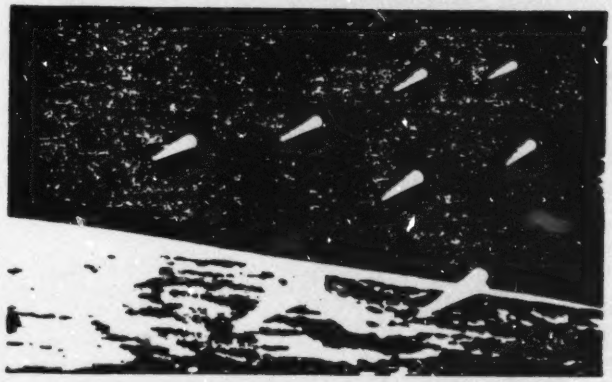
A second explanation involves American faith in technological solutions. Whenever the United States had the choice of building or foregoing new nuclear technology, it usually went ahead in hopes of capping the arms race or blocking the Soviets with the "ultimate" invention. And each time a new technology was developed, it affected American attitudes toward nuclear weapons. The production of the hydrogen bomb in 1952 and the intercontinental ballistic missile in 1954 gave President Eisenhower his faith in nuclear superiority. The development of MIRV technology and increased warhead accuracy in the early 1970s led Presidents Nixon, Ford, and Carter to believe nuclear weapons were more useful for war-fighting.

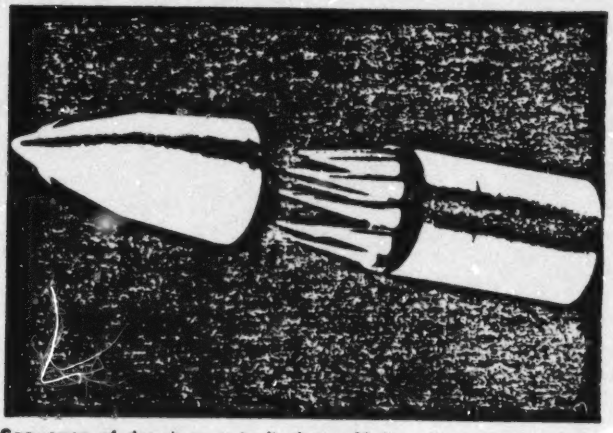
These technological developments are often at the expense of arms control. A recent example was President Nixon's decision not to pursue a MIRV ban in the SALT I agreements. Nixon intended to preserve an American technological lead, but when the Soviets MIRVed their land-based missile force, it gave rise to the perception that U.S. forces could become vulnerable to a Soviet first strike. This consequently affected Reagan Administration views on arms and arms control.

Often, what is termed as a failure of arms control is thus a failure of technological foresight. The next round of the arms race will probably be run with cruise missiles, which are currently being deployed on B-52s and are planned for use at sea and on land. Yet little thought is now being given to the impact this technology will have on the U.S. strategic position and on arms control.

Finally, the more Americans came to rely on nuclear weapons for political and military purposes, the less they were appreciated as weapons of mass destruction. In all the benchmarks of presidential attitudes on nuclear weapons—from ambivalence to superiority, credibility, parity, and vulnerability—only in the Kennedy-Johnson search for credibility was there acknowledgment that nuclear weapons are useless for war. In all other periods, strategies were developed to make nuclear weapons more politically and militarily useful. By contrast, very little government attention has been given to the utility of arms control in national security policy.







Sequence of drawings (I to I) shows Multiple Independently Targeted Reentry Vehicles carried in a single warhead separating so they proceed to different targets

In short, Bernard Baruch's prediction that failure to control nuclear weapons in 1946 would condemn "every man to be the slave of Fear" has proved correct. But though the fear of nuclear war is strong enough to result in limited arms control, the pressures to produce nuclear weapons have proved stronger.



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# Current Issues

## • SALT and START

Nuclear weapons which can be launched by one superpower from its own territory and can reach the territory of the other are called strategic nuclear weapons. The Soviets have about 7,800. As the numbers have grown from tens to hundreds to thousands, the superpowers have come to realize that further unrestrained growth could increase the dangers of nuclear war.

After some early attempts at negotiations failed, the U.S. and the Soviets finally entered into the Strategic Arms Limitation Talks (or SALT) in 1969. The SALT negotiations went on until 1979, almost without interruption.

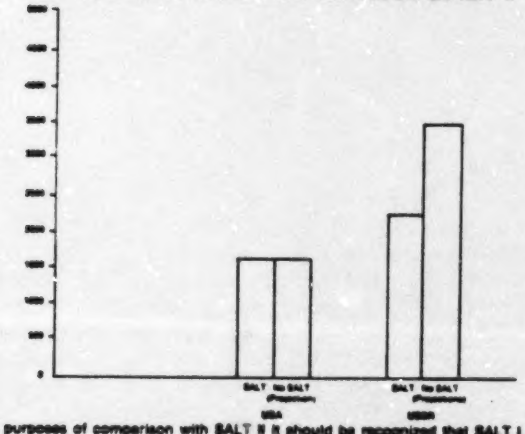
The first phase of SALT, SALT I, lasted from November 1969 until May 1972. The negotiations focused on limiting offensive systems, limiting defense systems, and verification. Verification was important because neither superpower thought it could rely on trust to ensure the other would comply with a treaty. Defensive systems were important because both the U.S. and the Soviets were proceeding with Anti-Ballistic Missile systems (ABMs).

Each was worried about the effects of an ABM on deterrence. An ABM raised doubts about whether enough missiles could get through to do "unacceptable damage" to a potential attacker. At the very least an ABM would act as a spur to the arms race, causing each side to produce more offensive missiles to offset a defense.

Negotiations on limiting offensive systems were made difficult by the different structure of the superpowers' nuclear forces. (See p. 7.) The Soviets relied heavily on ICBMs, which carried 75% of their warheads. The U.S. had a more balanced force, with most of our warheads on submarines.

After difficult negotiations, SALT I yielded two agreements. *The ABM Treaty* (and the subsequent protocol to it signed in 1974) limited each side to one ABM installation of not more than 100 missiles and launchers, which were to be deployed either around an ICBM site, or the national capital. Deployment of other ABM systems was banned. The Treaty also placed restrictions on qualitative developments related to ABM systems.

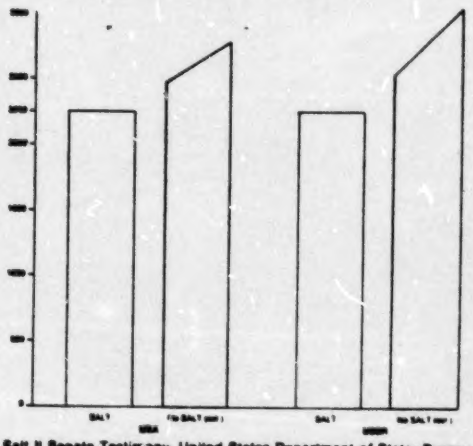
**1977 U.S. and U.S.S.R. ICBM and SLBM Launchers With and Without SALT I**



For purposes of comparison with SALT II it should be recognized that SALT I had no provision for the limitation of intercontinental bombers.

(Source: Adapted from the August 1, 1972 News Release of the U.S. Department of State; Bureau of Public Affairs)

**1985 U.S./U.S.S.R. ICBM/SLBM Launchers and Heavy Bombers With and Without SALT II**



(Source: Salt II Senate Testimony, United States Department of State, Bureau of Public Affairs, Washington, D.C., July 9-11, 1979.)

The ABM Treaty established the Standing Consultative Commission (SCC) to be used a forum for consultations by both sides regarding possible Treaty violations, and concerning future arms control talks. *The ABM Treaty* is of unlimited duration, but comes under review every five years.

*The Interim Agreement on Strategic Offensive Arms* froze the number of launchers of ICBMs and SLBMs. It also legitimized the use of National Technical Means (NTM). NTM are primarily satellites, ground-based radars, and radio transmission surveillance. Each side was prohibited from interfering with these verification methods. Finally, the *Interim Agreement* made it incumbent upon both sides to continue discussions toward greater arms reductions.

Given impetus by the success of SALT I, the second phase of strategic arms negotiations, the SALT II talks convened in Geneva, Switzerland in November 1972. While the SALT I *Interim Agreement* had slowed the arms race, there was increasing interest in the United States, and especially in the Congress, for a SALT treaty which produced real reductions. Initially the goal of SALT II was to obtain a comprehensive agreement for broad limits on *all* strategic delivery vehicles, greater moves toward significant arms reductions, and restrictions on qualitative improvements in strategic weapons systems.

While discussions proceeded through 1973 and 1974, the first breakthrough came at the November 1974 Vladivostok meetings between Presidents Ford and Brezhnev. The basic framework for the SALT II Treaty emerged from this meeting. Talks then resumed in Geneva in 1975, where a joint draft text of the agreement emerged.

The problems of negotiating strategic reductions in the face of arsenals composed of markedly different types of weapons plagued the SALT I negotiators. The SALT II talks again were confronted with this problem of "asymmetrical arsenals;" new systems such as the American Cruise Missile and the Soviet Backfire Bomber posed additional difficulties.

The SALT II talks were also interrupted by the 1976 American Presidential election. However, the Carter Administration stated its interest in achieving an arms control treaty,

Continued on page 20

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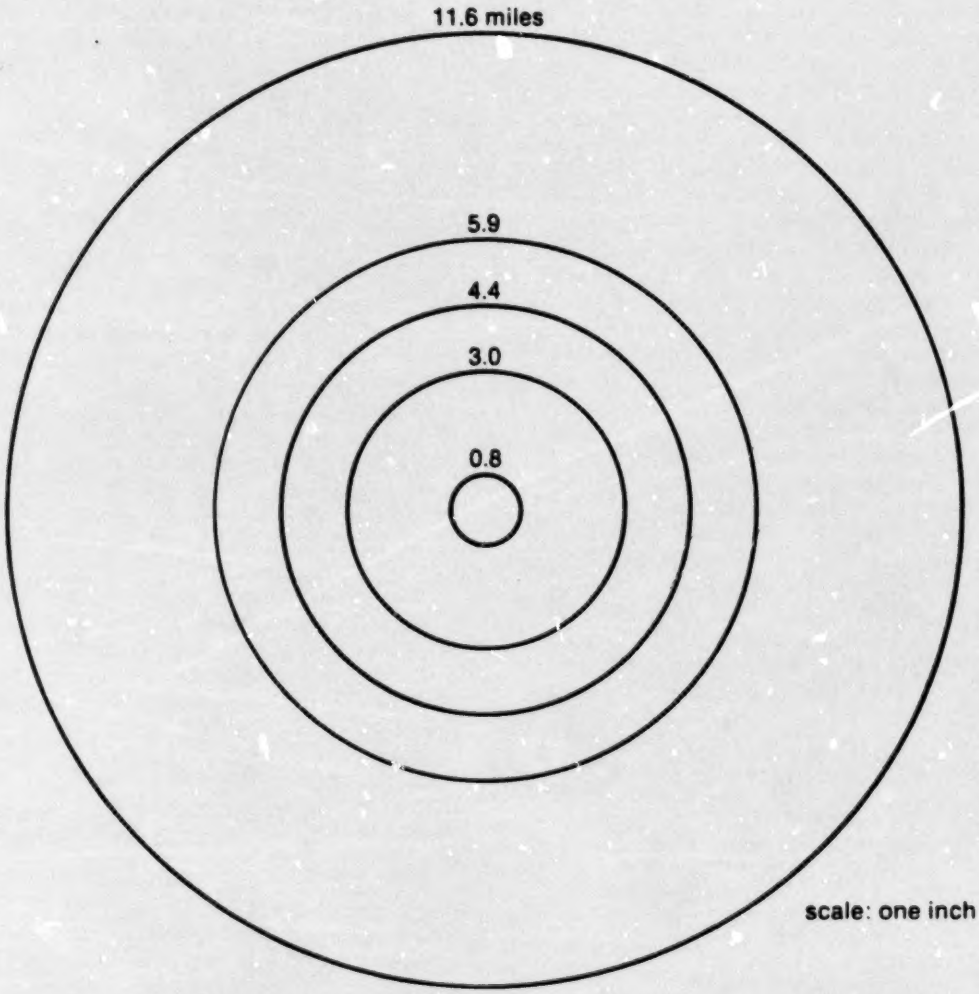
# The Effects of Nuclear Weapons

*By first copying this diagram onto a city map with a one inch: four miles scale, and then reading the attached chart, you can get a rough idea of the effects of a nuclear explosion.*

*For the purpose of simplicity, the data provided refer to an attack involving a single, one megaton bomb detonated at 8,000 feet on a clear day at sea-level. An actual attack might consist of many warheads and a different set of conditions.*

*For further information please refer to the U.S. Department of Defense publication,* The Effects of Nuclear Weapons *or, the U.S. Office of Technological Assessment* The Effects of Nuclear War.




Could you literally "run for your life" if a one megaton (1 MT) warhead was launched in a surprise attack against your town?

Though more warning time is generally assumed, the distance you can run from the explosion point, called "ground zero," in the thirty minutes it takes for a Soviet warhead to reach the United States, helps illustrate the destructive potential of a single nuclear warhead.

Without transportation available, imagine you start running at the first sound of alarm. If you can sprint a 6-minute mile, by the time the weapon explodes you will be 5 miles from ground zero. At this point, the heat is so intense that exposed skin is charred and clothing ignites; winds blowing at 130 miles per hour spray the landscape with debris and broken glass; the roof on a nearby hospital flies off and windows shatter. The immediate radiation dose will eventually kill over one-half of those in the area (who do not die

from the other effects).

For slower runners, those averaging a ten-minute mile, the surroundings are far more dangerous. At 3 miles from ground zero, typical concrete office buildings are collapsing all around; people and objects in buildings not crushed are blown out of windows by 250-mile winds. Those not killed by the direct effects would receive lethal radition doses and die in six weeks' time.

These scenes illustrate the local primary effects of nuclear weapons: initial nuclear radiation, thermal radiation pulse, and blast. (Note that conventional weapons have only one destructive effect, which is the blast or shock wave.)

Initial nuclear radiation comes from invisible, highly-penetrating gamma rays which are emitted in the first minute of the explosion when atoms fission (fly apart) and fusion (join together) in a typical nuclear reaction. This radiation alters or destroys human cells. It is so penetrating that people surrounded by 24 inches of concrete one mile from a 1 MT blast would perish. The radiation effect is a significant difference from conventional weapons which is generally not appreciated.

**Biological Effects of Thermal Radiation**

| Type burn | Distance from ground zero |
|---|---|
| **third degree**: pain experienced only in region surrounding burn as nerve damage occurs in area directly burned. all layers of skin affected hence long heal time and slow scab formation. | 0-5 mi |
| **second degree**: intense and persistent pain, blisters and scabs form. danger of infection, outer layers of skin affected. | 5-7 mi |
| **first-degree**: mild pain and redness of afflicted area, only superficial layers of skin affected. | 7-12 mi |

Source *The Effects of Nuclear War* The Office of Technology Assessment

The second primary effect, thermal radiation, is more familiar. It is the tremendous energy released in the form of heat and light during the nuclear explosion. Unlike a conventional weapon, which releases energy from a chemical reaction, the punch from nuclear weapons comes from the forces which bind all matter together in atoms. These forces are so powerful that, when released, their energy is millions of times greater than conventional weapons per pound of explosive material. Consequently, temperatures reach tens of millions of degrees, or superstellar level, in the nuclear fireball, as opposed to a few thousand degrees in a conventional bomb. The thermal pulse will cause third-degree burns on persons eight miles from ground zero in a 1 MT explosion, or over an area of 250 square miles.

The hot gaseous materials created by the nuclear burst expand rapidly and form the final primary effect: a pressure wave, known as blast or shock. The shock front races like a wall of compressed air outward from the fireball (which, at a distance of 50 miles from a 1 MT burst, appears many times more brilliant than the sun at noon). High winds, still 70 mph even six miles from ground zero, will accompany the blast wave. In addition, great pressures are created, enough to crush frame houses several miles out.

These primary effects by no means tell the whole story. Residual radiation and fallout, which is radioactive debris, remain after the explosion, and can carry great distances depending on the wind. (The Office of Technology Assessment believes survivors should remain indoors for two weeks to a month after an attack to assure safety from fallout). Also, massive fires would result from the tremendous winds and heat.

In addition, there is an electromagnetic pulse (EMP) effect, something crudely like radio transmissions, which was only recognized in 1960 as a serious nuclear effect. EMP from a single burst high over the United States could damage computers, solid-state components, electrical and communications equipment over the entire country.

These primary and residual effects of nuclear weapons are well documented from U.S. Goverrnment tests, but also, from the two atomic bombs the U.S. dropped on Hiroshima and Nagasaki in 1945. In an instant, a teeming Hiroshima of 340,000 people turned to rubble, swallowing a third of the population. Survivors of the blast depict a nightmare more vivid than mere statistics can express.

How would this nightmare take shape in the U.S.? Because there are so many uncertainties about nuclear war, predictions on exact conditions are hard to gauge. But deaths from a "limited" attack on U.S. land missiles could range up to 20 million. Even this "small" civilian loss would bring tremendous economic, psychological, and long-term genetic effects. For a full-scale attack, the disaster would increase immeasurably. Some 160 million could perish, and those who survive would have little if any medical attention, food, and the means to support life.

Finally, what would be the effect if all nuclear weapons, more powerful than a million Hiroshimas, exploded in a world war? Would it mean the end of the earth? Though the planet would not expire in a strict sense, the earth's ecology could be irrevocably altered. In the words of one writer, the U.S. would become "a republic of insects and grass."

**Blast Effects of a 1-Mt Explosion 8,000 ft Above the Earth's Surface**

| Distance from ground zero (mi) | Peak overpressure | Peak wind velocity (mph) | Typical blast effects |
|---|---|---|---|
| .8 | 20 psi | 470 | Reinforced concrete structures leveled. |
| 3.0 | 10 psi | 290 | Most factories and commercial buildings collapsed. Small wood-frame and brick residences destroyed. |
| 4.4 | 5 psi | 160 | Lightly constructed commercial buildings and typical residences destroyed. heavier construction severely damaged. |
| 5.9 | 3 psi | 95 | Walls of typical steel-frame buildings blown away. severe damage to residences. Winds sufficient to kill people in the open. |
| 11.6 | 1 psi | 35 | Damage to structures; people endangered by flying glass debris. |

Source *The Effects of Nuclear War*, The Office of Technology Assessment

# Start

From page 17

and opened SALT discussions in early 1977. The SALT II Treaty which was signed in Vienna in June of 1979 reflected the basic Vladivostok framework and an American desire for more comprehensive limitations. The Treaty itself was to be in force until 1985, with a Protocol covering a number of other issues to last until the end of 1981.

SALT II dealt successfully with the problem of asymmetrical arsenals by providing a freedom to mix launcher types within an overall ceiling of 2400 strategic delivery vehicles (to be reduced to 2250 by December 31, 1981). This allowed both sides to place emphasis on whichever systems each preferred, and prevent the Treaty from biasing one system or another. Each side was limited to 1200 MIRVed ballistic missile launchers and 820 MIRVed ICBM launchers. In addition, sections of the SALT I *Interim Agreement*, such as that limiting ICBM conversions, were formally incorporated into the SALT II Treaty.

SALT II also increased the restrictions upon qualitative improvements for strategic weapons systems. Development, testing, and deployment of missile systems which could be rapidly reloaded was prohibited, as was the development of more than one "light" ICBM system by each side. This new system was limited to a maximum of 10 reentry vehicles, and its overall size could not exceed that of the largest missile in existence at the time of the signing. In addition to these important technical issues related to specific weapons systems, the SALT II Treaty established an agreed upon data base and counting rules. Both of these developments added reliability to the National Technical Means of verification established in SALT I, and affirmed again in SALT II. The data base was particularly important since it allowed both sides to establish with a high degree of confidence what types and numbers of weapons the other side possessed.

The Protocol to SALT II prohibited the deployment of land and sea-based Cruise missiles, which posed great verification difficulties. It also prevented testing or deployment of mobile ICBM systems, and Air to Surface Ballistic Missiles (ASBM) systems. As in the SALT I Treaty, each side was required to pursue additional reductions through future SALT negotiations.

The SALT II Treaty was never ratified, largely because of rising U.S.-Soviet tensions, highlighted by the Soviet invasion of Afghanistan. Moreover, in 1980, President Reagan won the election after a campaign in which he denounced SALT II as "fatally flawed."

# Verification

Air Force reconnaissance photo of Soviet missiles in Cuba, 1962. Verification capabilities have increased markedly in the last twenty years.

When nations sign a treaty, each signer wants to make sure the others are living up to their end of the bargain. They do this through "verification" checking to see that other nations are living by the rules of the treaty. For the Soviet Union and the United States, verification issues were the dominant impediment to arms control agreements from 1946 to the SALT I accords.

### *Methods for Verification*

Verification mechanisms have always been closely tied to more general methods of intelligence-gathering and reconnaissance, developments in the latter area have meant greater capabilities in the former. Throughout the 1940s and the 1950s, both reconnaissance and verification relied upon photographs taken by high-flying aircraft such as the famed U-2. These planes carried photographic equipment considered antiquated by today's standards.

From the launching of Sputnik in 1957, both the Soviet Union and the United States realized the importance of missile technology, both for weapons, and for satellite observation and reconnaissance. Soon after 1960, American satellites became invaluable intelligence collectors. It is important to point out that developments in high resolution satellite photography, infra-red and other methods of detection heavily influenced the United States in moving toward serious strategic arms limitation discussions.

### *Present Status of Verification*

From the SALT I accords onward, both sides have come to increasingly rely on what are known as National Technical Means (NTM) of verification, employing a combination of photo-reconnaissance and other types of satellites, and ground-based methods of monitoring. While the verification issue has been highly contentious, and the subject of often heated debate, both the United States and the Soviet Union have officially recognized the legitimacy of National Technical Means of verification.

### *Importance of Verification to Arms Control*

By placating American demands for adequate verifiability and overcoming Soviet objections to on-site inspection, National Technical Means of verification have contributed heavily to much of the progress in arms control agreements. Effective verification mechanisms are vital to successful arms control agreements because they do not require either side to trust its partner with its national security interests. Thus, one may have an arms control agreement without dependence upon the possibly dubious assurances of an adversary concerning treaty compliance.

But the Reagan Administration has not abandoned the strategic arms negotiation process. The new Administration is abiding by the terms of SALT II and has said it will continue to do so as long as the Soviets do. Moreover President Reagan has said he will negotiate with the Soviets on strategic arms. However, his approach will probably be different. He has already given the talks a new name, START, Strategic Arms Reduction Talks. Administration officials have also said that limits will no longer be enough. The Administration has talked about new means of verification.

## • *Test Ban*

Nuclear testing has been a subject of controversy almost since the start of the nuclear age. Proponents have traditionally argued that tests improve our knowledge of nuclear weaponry, while more recently arguing that "prooftesting" for reliability is a must. Opponents have been concerned about the health dangers of nuclear testing, especially from radiation. They also argue that a test ban would slow the arms race, as well as inhibit the spread of nuclear weapons to other countries.

When nuclear weapons were first being tested, scientists could not be sure about their possible effects. In one case a U.S. test weapon yielded twice the explosive force and much more radioactivity than predicted. Similarly, a Soviet test caused radioactive rain to fall over a part of Japan. Nonetheless, vigorous testing programs continued on both sides.

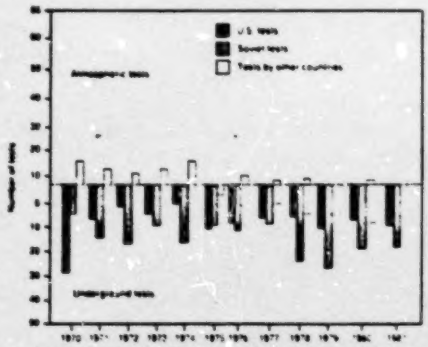
Meanwhile, growing concern world-wide about the effects of radiation led to calls for a halt on testing. A Comprehensive Test Ban (CTB) was thus first proposed under Eisenhower. After much deliberation and several diplomatic moves, a moratorium on tests was agreed to by the U.S., U.S.S.R. and Great Britain in 1958. Negotiations resulted in the groundwork for a test ban by 1960. The following year, however, the talks broke down and testing resumed.

Interest in a test ban remained. The Cuban Missile Crisis gave new impetus to arms control and a second moratorium was agreed to in 1963. Shortly thereafter, the three superpowers agreed to the Limited Test Ban Treaty (LTBT), which banned tests aboveground, underwater, and in outer space. Due to the difficulty of detecting underground tests, some form of on-site monitoring—either inspectors or electronic devices—are required. In 1963, the superpowers could not agree on these verification procedures, so underground testing continued.

Today, most countries of the world are signatories of the LTBT, with the significant exceptions of France and China. The latter have continued testing aboveground, although public opinion has forced a halt to French tests in recent years.

As further steps toward a CTB, the U.S. and the Soviets agreed to two other treaties on testing during the seventies. The first, in 1974, was the Threshold Test Ban (TTB) which banned underground weapons explosions in excess of 150 kilotons. Two years later this treaty was supplemented by the Peaceful Nuclear Explosion Treaty (PNET) which banned peaceful nuclear explosions above that level. Both of these treaties remain unratified by the U.S. Senate.

A Comprehensive Test Ban, however, is still the ultimate goal; it is thus debatable as to the effect that the TTB and the PNET would have on the negotiation of a CTB. Whether positive or negative, they are nonetheless limited measures,



Nuclear tests conducted by the United States, the Soviet Union, Great Britain, France, and China, 1970-81. Adapted with permission from "World Armaments and Disarmament," *SIPRI Yearbook*, 1972, p. 408.

since most of the testing done today is on weapons smaller than 150 kilotons.

These limited measures have been eclipsed in recent years by controversy over a CTB itself. Proponents point out that radioactivity underground, as well as leaks above ground, are health risks. There were 20 such leaks in the U.S. from 1963 to 1971. Opponents downplay the health risks.

There is controversy regarding the need for further testing. Proponents argue that a CTB would prevent the fine-tuning of an already mature technology, while opponents maintain that such fine-tuning is essential. Opponents also contend that periodic testing is necessary to make sure our weapons are still functioning. Those in favor of a CTB, on the other hand, maintain that increased lack of confidence in either side's weapons capabilities would render them more unlikely to use those weapons in a first strike.

Proponents also say that a CTB would make the superpowers' call for non-proliferation more credible. Many nations, such as India, do not feel compelled to halt their nuclear weapons programs while the superpowers continue large-scale weapons testing. A CTB would fulfill the obligations of the superpowers under the NPT for disarmament and give a boost to stopping the spread of nuclear weapons. As Herbert Scoville has stated, "unless there is a test ban the proliferation problem won't be solved."

Opponents of a CTB also argue that it is impossible to detect Soviet underground tests. Proponents, however, point out that the technological capabilities today are far more advanced than they were in 1963; that it is in fact possible to detect small nuclear explosions, down to the size of one kiloton. Tests smaller than this would have little military value.

Finally, it must be mentioned that, despite a withdrawal clause (a country may pull out after 3 months notice—the treaty itself would last 3-5 years), a CTB may inhibit the nuclear aspirations of a suddenly powerful radical leadership of a country who, as the twentieth century has taught us, may stop at nothing to gain their ends. Being aware of their intentions, we might be able to block their weapons development program.

Under the Carter Administration, significant progress was made toward negotiating a CTB. This included providing for a "committee of experts," who among other things would consider questions relating to the international exchange of

Continued on page 22

seismic data. Another of their functions would have been to determine the technological standards for monitoring stations, or "black boxes," to be placed on each opponent's soil. In addition, groundwork was made in relation to on-site inspection procedures.

The Current Director of ACDA, Eugene Rostow, stated in October, 1981 that for the Reagan Administration, a CTB Treaty is no longer a priority goal but a "long-term" interest.

## • *Chemical and Biological Weapons*

Chemical and biological weapons are highly noxious threats; fortunately, both are limited to some extent by arms control agreements. Modern chemical weapons have only been used on a wide scale in World War I, when gases such as mustard gas were developed. The tragic effects of chemical warfare motivated Europeans to include a provision in the Versailles Treaty outlawing the future use of gas. This treaty was rejected by the United States because of its provision establishing the League of Nations. The Geneva Convention of 1925 also produced a Protocol stating that: "the use in war of asphyxiating, poisonous or other gases, and of all analogous liquids, materials or devices, has been justly condemned by the general opinion of the civilized world." Although the U.S. upheld this protocol in World War II, it was not ratified by Congress until 1975. The U.S. interprets this agreement as banning only the first use of chemical weapons, but not research or stockpiling of such weapons. The U.S. also feels that use of non-toxic gases (like tear gas for riot control) or herbicides (defoliants such as Agent Orange) is not limited by the Protocol.

Biological weapons have never been used by the United States, and have rarely been used elsewhere in the world for modern warfare. Biological or germ warfare will hopefully remain the stuff of science fiction. These weapons use living organisms such as bacteria, viruses or fungi, which can multiply once they are spread into the environment. In 1969 President Nixon declared that the United States unilaterally renounced the production or use of biological weapons. All existing biological agents and existing biological agents and weapons in stock were destroyed. At the same time, the production of American chemical weapons was also ceased. In 1972, the Biological Weapons Convention was signed by over a hundred countries. It prohibits the development, production and stockpiling of biological agents or toxins for nonpeaceful use. This treaty was intended to eliminate an entire class of weapons from the world's arsenals. However, evidence suggests that the Soviet Union is producing or experimenting with the germ anthrax.

NATO troops in anti-chemical gear. (Pentagon)

Although the United States has no biological weapons, it maintains stockpiles of chemical weapons here, in the South Pacific, and in West Germany. Stockpiling in Europe has provoked much opposition from NATO and West Germany. Europeans directly experienced the insidious effects of poisionous gases in World War I, and it remains a highly sensitive, emotional issue. In 1970 West Germany renounced the possession of chemical weapons and refused to train troops to use them. The United Kingdom has also formally refused to train, to acquire or to base chemical weapons in their country.

Despite the resistance of our allies, the United States has recently allocated funds to begin production of a new binary-chemical weapon, thus reversing the 1969 ban. Binary weapons are considered to be safer by the military than traditional nerve gas weapons. The way they work is that two non-toxic chemicals are contained in separate compartments within an artillery shell; when the shell is fired, the two chemicals combine to form nerve gas. This design makes the unintended release of nerve gas unlikely, and makes storage or disposal of the chemicals easier. Even if binary chemical weapons are an improvement on the old model, they will doubtless not win the approval of our allies, and so could not be used in European defense.

Why then are chemical weapons experiencing a rebirth in American defense policy? Evidence shows that the Soviet Union has broken the Geneva Protocol by using mycotoxins (Yellow Rain) in Southeast Asia and Afghanistan. The United States wishes to counter this development by upgrading their supply of chemical weapons.

Despite the important arms control agreements limiting their use, chemical and biological weapons must still be carefully monitored and evaluated. The main problem with any chemical weapon is that while soldiers are usually protected from its effects by gas masks and other clothing, civilians are not. Innocent people can become the main casualties.

## • *Non-Proliferation*

Since the U.S. dropped the first atomic bomb on Hiroshima, four other members joined the nuclear club—the Soviet Union, France, Great Britain, and China. India, which exploded a single bomb in 1974, is a kind of "junior" member. Each new member raises the chances that nuclear weapons may be used for war or blackmail. What will be the next nuclear nation? How can the spread of nuclear weapons, or *proliferation*, be stopped?

A combination of technical and political barriers have been

developed to block the bomb's spread. These *nonproliferation* efforts have been largely successful, but there is still reason for concern.

The technology for making a simple atomic bomb is old and well-understood. Any would-be bomb-maker, however, would need to leap over two technical hurdles. The first is to acquire the fissionable, or explosive, material, and the second is to design and fabricate the material into a bomb. Nonproliferation policies attempt to raise these hurdles as high as possible to thwart the efforts of nations going nuclear.

The foundation of all fissionable material is two isotopes of uranium—U-235 and U-238. The first is used for uranium bombs like the one dropped on Hiroshima, and the second for the production of plutonium, as used in the Nagasaki bomb. Since an extract of uranium ore, "yellowcake," is available in many countries worldwide, there are few limits on the source of these isotopes. Separating and treating them is far more difficult. To get uranium for bombs, the *enrichment* process increases the U-235 content from .7 percent, as it occurs in nature, to over ninety percent. By contrast, the uranium fuel used to generate electricity in nuclear reactors is only 3 percent U-235 (making it unsuitable for weapons).

To make plutonium, U-238 is exposed to neutrons in a reactor. The irradiated uranium, or "spent fuel" is cut up and dissolved in a "reprocessing plant" where plutonium is recovered. Small research reactors, large power reactors, and special production reactors can all be used. The differences are in quantity and quality of the plutonium.

There is no theoretical barrier to acquiring knowledge on "sensitive" technologies such as enrichment and reprocessing. Only the most advanced nations, however, have the industrial base and technological expertise to enrich uranium in significant quantities. By contrast, many more nations with only a medium level of development could put together a "quick and dirty" reprocessing facility. It is estimated that by the mid-1980s, Argentina, Brazil, India, South Korea, Pakistan, Taiwan, and Israel could have enough plutonium and acquire the facilities to reprocess it.

Once the fissionable material is acquired, the second hurdle for a would-be nuclear-nation is the fabrication of the material into forms and shapes for a previously designed bomb. All the countries mentioned above could probably have this capability by the 1990s as well, since more information is available in the open literature.

In an effort to arrest the route to bomb-making through "sensitive" technologies, the London Nuclear Group Suppliers Guidelines were signed in 1977 by fifteen nations, including the United States and Soviet Union. The agreement calls on group members to "exercise restraint" in the export of enrichment, reprocessing, and other sensitive technologies. France later suspended its contract with Pakistan for supply of a reprocessing plant. However, not all suppliers are willing to lose valuable sales on nuclear equipment, so the Guidelines have had only limited success. Pakistan set up dummy corporations in Europe and clandestinely managed to supply a small enrichment facility that is still in development. Even without outside assistance, South Africa designed a small enrichment plant on its own technology base.

To strengthen these technical efforts, political barriers play a vital role in stemming proliferation. The first such

**A world of nuclear powers would threaten the security of both the U.S. and the Soviet Union.**

effort was made in 1953, when President Eisenhower announced the Atoms-for-Peace proposal. If technology was shared by the United States, Eisenhower hoped, nations would put the atom to peaceful purposes, such as for medicine, agriculture, and the generation of electricity. He set up a new UN agency, the International Atomic Energy Agency (IAEA), to aid the transfer of technology and to safeguard it from military diversion.

Today, the IAEA monitors uranium flows through 227 nuclear reactors in 37 countries, ensuring by visual inspection that none of the uranium for peaceful purposes can be diverted to military use.

A more far-reaching political barrier was devised in the U.S.-Soviet negotiated Non-Proliferation Treaty (NPT), completed in 1968 and now signed by 114 nations. Signatories agree not to produce or develop nuclear weapons, and accept "full-scope" IAEA safeguards on all their peaceful nuclear activities.

In return, the nuclear powers promise to make technology available to non-nuclear states and to "pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date . . ." This basic bargain between the nuclear haves and have-nots is the core of the non-proliferation regime today.

In many respects, the NPT is the most significant arms control agreement from the perspective of international security. By its list of adherents, the overwhelming majority of world nations agree that ownership of nuclear weapons *decreases* regional and global stability. This makes local tensions less likely to erupt in nuclear holocaust.

Still, some problems remain. Many countries are outside the regime, keeping open their option to "go nuclear." They believe it is unfair for nuclear powers like the U.S. and Soviet Union, whose stockpiles grow yearly, to dictate the security policy of other nations. These include India (still not a full club member), Pakistan, South Africa, Israel, Libya, Argentina, and Brazil; all are located in potential hot-spots. In addition, many nuclear suppliers seem willing to provide

Continued on page 24

technology to these countries, even though they have not signed the NPT.

A recent incident in the Middle East dramatizes these issues. In June 1980, Israel conducted an air raid on Baghdad, Iraq and crushed a small research reactor capable of reprocessing plutonium. Iraq is an NPT nation and had French and Italian-supplied equipment safeguarded by agreement with the IAEA. Israel's action was a slap to the IAEA and a statement of mistrust in the nonproliferation system. But from Israel's point of view, a hostile neighbor with the potential to produce nuclear weapons was an overriding security threat.

This incident demonstrates the delicacy of a nation's decision to go nuclear, and may offer one explanation why the nuclear club is relatively small. Having nuclear weapons sets a country up as a target for military action. But there have been other reasons why nations did not acquire nuclear weapons. Germany feared foreign reaction; Sweden felt the cost was not justified for the security return; Japan had strong domestic opposition.

Unfortunately, these reasons may not be sufficient to stop another would-be nuclear power or terrorist organization. As a result, efforts remain strong, particularly from the United States and Soviet Union, to keep the nuclear club from expanding.

**Intermediate-Range Ballistic Missiles***

| NATO | | USSR | |
|---|---|---|---|
| UK SLBM | 64 | SS-20 | 243** |
| French SLBM | 80 | SS-4 | 350 |
| French IRBM | 18 | SS-5 | |
| | | SS-N-5 | 39 |
| Total | 162 | | 632 |

*1,000-5,000 kilometer range
‡Of these, 70 Backfire, 40 Blinders and 270 Badgers are Soviet Naval Air Force Bombers.
Source: Military Balance 1981-1982 (London, IISS, 1981); NY Times, 11.30.81

**Medium-Range Nuclear Capable Aircraft**

| NATO | | USSR | |
|---|---|---|---|
| UK Vulcan | 57 | Backfire Tu-26 | 135 |
| UK Buccaneer | 60 | Blinder Tu-22 | 165 |
| French Mirage IVA | 33 | Badger Tu-16 | 580 |
| US F-111 | 164 | | |
| US FB-111 | 63 | | |
| Total | 377 | | 880‡ |

**The U.S. Department of State estimates Soviet SS-20 deployments at 300 as of March 16, 1982. Leonid Zamyatin, a member of the Central Committee of the Soviet Communist Party, claims that no additional SS-20s have been deployed since November 1981.

## • *Theater Nuclear Weapons*

The North Atlantic Treaty Organization was formed after the end of World War II to ally the security interests of the United States and Western Europe. The countries signing the treaty in 1949 agreed that "an armed attack against one or more of them in Europe or North America shall be considered an attack against them all." Thus the United States promised to defend Europe against a Soviet attack as if it were an attack on our own country.

NATO forces are tripartite: conventional troops and weapons; theater nuclear forces; and strategic nuclear forces based in the United Kingdom and the United States. The nuclear weapons are intended to deter the Soviet Union from acts of aggression in Europe. Having a range of short, medium and long range nuclear weapons in addition to the conventional forces would allow NATO a "flexible response" to Soviet attack should deterrence fail.

Intermediate or "theater" nuclear forces (those capable of striking the Soviet Union from Europe or vice versa) are now subject of complex arms control talks. In the past decade, the Soviets have modernized and significantly improved their theater nuclear weapons by deploying the SS-20 missile and the Backfire bomber. In 1979 NATO responded to this new threat with a two-track decision to modernize their own forces while also pursuing arms control negotiations. If an acceptable arms control agreement is not reached by 1983, NATO will deploy a new generation of Pershing II launchers and cruise missiles.

While Europeans support the need to modernize the weapons defending their countries, they are also understandably anxious about the idea of theater nuclear war, because their homes would be the theater! If nuclear weapons were used in Europe, it is claimed that the U.S. would be "liberating a corpse." American nuclear weapons were originally placed in Europe to counteract a greater Soviet conventional capability, and to assure the safety of Europe as it recovered from World War II. Now a portion of the European public protests the presence of nuclear weapons on their soil. This neutrality movement is ironic because American nuclear weapons exist in Europe by Europeans' own insistence, as a sign of America's willingness to defend their territory. However, the ebb and flow of public opinion plays a vital role in democratic political decision-making. The recent anti-nuclear protests have accentuated the need for arms control.

The Soviet Union does not worry about the public opinion factor, but it is nevertheless willing to engage in arms control negotiations. Although the U.S. and USSR are considered to have strategic parity (overall equivalence in nuclear weapons), Soviets nuclear forces are concentrated in the European theater. The addition of the SS-20 missile to their strategic stockpile gives the USSR a special advantage in this area.

Both the USSR and NATO wish to achieve a stable balance of arms through an arms control agreement. However, each side defines the threat it faces differently. The USSR feels surrounded by enemies including Europe, the USA, and China. Thus in the Intermediate Nuclear Force talks, the Soviet Union would like to include French, British and American forces which are not part of NATO. The United States cannot negotiate for weapons that it does not control, and it has security interests in other parts of the world for which it maintains forces. Defining the terms of negotiation is especially difficult in the European theater because many countries' interests and perceptions of the problem are involved. However, a unifying thread between all parties is the desire to deter nuclear war and to stabilize theater forces through arms limitations.

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# Glossary

**Acronyms**

| | |
|---|---|
| ABM | anti-ballistic missile |
| ACDA | Arms Control and Disarmament Agency |
| ALCM | air-launched cruise missile |
| ASW | anti-submarine warfare |
| AWACS | airborne warning and control system |
| BMD | ballistic missile defense |
| CCD | Conference of the Committee on Disarmament |
| CD | Committee on Disarmament |
| CEP | circular error probable |
| $C^3I$ | command, control, communication, and intelligence |
| CSCE | Conference on Security and Co-operation in Europe |
| CTBT | comprehensive test ban treaty |
| DOD | Department of Defense |
| FBS | forward-based system |
| GLCM | ground-launched cruise missile |
| ICBM | intercontinental ballistic missile |
| INF | intermediate nuclear forces |
| IRBM | intermediate-range ballistic missile |
| LRTNF | long range theater nuclear force |
| MBFR | Mutual and Blanced Force Reductions Talks |
| MIRV | multiple independently-targetable re-entry vehicle |
| MRBM | medium-range ballistic missile |
| MX | missile experimental |
| NPT | Non-Proliferation Treaty |
| NTM | national technical means |
| psi | pounds per square inch |
| R&D | research and development |
| SALT | Strategic Arms Limitation Talks |
| SCC | Starting Consultative Commission |
| SLBM | submarine-launched ballistic missile |
| SLCM | sea-launched cruise missile |
| SSBN | a nuclear-propelled ballistic-missile-bearing submarine (so designuted by the U.S. Navy) |
| START | Strategic Arms Reduction Talks |
| STOP | Strategic Talks on Prevention of Nuclear War |
| TTBT | Threshold Test Ban Treaty |

**Arms Control Terms**

**air-launched cruise missile**—*See* cruise missile.

**airborne warning and control system (AWACS)**—A flying command post. AWACS has the capacity to identify hostile aircraft and to control friendly air forces in either offensive or defensive missions.

**anti-ballistic missile (ABM) system**—A system of missiles and radars capable of defending against a ballistic-missile attack by destroying incoming offensive missiles. The defensive missiles may be armed with either nuclear or non-nuclear warheads.

**anti-submarine warfare (ASW)**—The detection, identification, tracking, and destruction of hostile submarines. ASW can be either strategic (aimed at neutralizing an opponent's ballistic-missile submarines), or tactical (concerned with the pursuit and destruction of submarines in a local situation for missions such as convoy defense and aircraft carrier defense).

**arms control**—Any unilateral action or multilateral plan, arrangement, or process, resting upon explicit or implicit international agreement, which limits or regulates any aspect of the following: the production, numbers, type configuration, and performance characteristics of weapon systems (including related command and control, logistics support, and intelligence arrangements or mechanisms); and the numerical strength, organization, equipment, deployment or employment of the armed forces retained by the parties. A list of arms control agreements in force or being negotiated may be found at the end of the glossary.

**arms limitation**—*See* arms control.

**arms transfer**—The sale or grant of arms from one nation to another.

**ballistic missile**—A missile, classified by range, that moves on a free-falling trajectory under the influence of gravity

**ballistic missile defense (BMD)**—*See* ABM system.

**binary nerve gas**—A toxic gas created by the mixture of two relatively harmless chemicals during the final trajectory stage of a missile, bomb or shell in which the gases are loaded. Because its two components are non-toxic until they are combined, binary gas can be stored and handled more easily than other toxic gases.

**bomber**—An aircraft, usually classified by range, capable of delivering nuclear and non-nuclear ordnance. Long-range bombers are those capable of traveling 6,000 or more miles on one load of fuel; medium-range bombers can travel between 3,500 and 6,000 miles without refueling.

**breeder reactor**—A reactor that produces more nuclear fuel than it consumes while generating power.

**circular error probable (CEP)**—A measure of missile accuracy. It is the radius of a circle around a target in which 50 percent of the missiles aimed at that target will land.

**civil defense**—The protection of civilian targets without the use of weapon systems.

**command, control, communication, and intelligence ($C^3I$)**—The "nerves" of military operations, that is, information-processing systems used to detect, assess and respond to actual and potential military and political crisis situations or conflicts. $C^3I$ includes systems which manage materiel and manpower during crises or conflicts, as well as in peacetime.

**confidence-building measures**—Measures taken to demonstrate a nation's lack of belligerent or hostile *intent*, as distinguished from measures which actually reduce military *capabilities*. Confidence-

building measures can be negotiated or unilateral. The division between confidence-building measures and arms control measures is not strict; the former may involve, for example, troop withdrawals, while the latter may aim more at securing trust than limiting weaponry.

**counterforce**—Directed against an opponent's military forces and military industry. Used to describe military strategies, attacks, weapons, etc.

**countervalue**—Directed against an opponent's civilian and economic centers. Used to describe military strategies, attacks, weapons, etc.

**crisis stability**—A strategic situation in which neither side has an incentive to use nuclear weapons during a crisis.

**cruise missile**—A pilotless missile, propelled by an air-breathing jet engine, that flies in the atmosphere. Cruise missiles may be armed with either conventional or nuclear warheads and launched from an aircraft, a submarine or surface ship, or land-based platform.

**damage limitation**—The capacity to reduce damage from a nuclear attack, by passive or active defenses or by striking the opponent's forces in a counterforce attack.

**dense pack**—A basing proposal for the MX missile in which silos are placed very close together. Supporters of the dense pack system argue that incoming missile "fratricide" will increase MX survivability.

**deterrence**—Dissuasion of a potential adversary from initiating an attack or conflict, often by the threat of unacceptable retaliatory damage. Nuclear deterrence is usually contrasted with the concept of nuclear defense, the strategy and forces for limiting damage, if deterrence fails. Some hold that a strategy of nuclear defense may also have a deterrent effect, if it can reduce the destructive potential of a nuclear attack.

**disarmament**—In UN usage, all measures related to the prevention, limitation, reduction or elimination of weapons and military forces. *See* general and complete disarmament.

**fallout**—The spread of radioactive particles from clouds of debris produced by nuclear blasts. "Local fallout" falls to the earth's surface within twenty-four hours of the blast.

**first strike**—An initial attack with nuclear weapons. A *disarming* first strike is one in which the attacker attempts to destroy all or a large portion of its adversary's strategic nuclear forces before they can be launched. A *preemptive* first strike is one in which a nation launches its attack first on the presumption that the adversary is about to attack.

**first use**—The introduction of nuclear weapons into a strategic or tactical conflict. *See* first strike. A no-first-use pledge by a nation obliges it not to be the first to introduce nuclear weapons in a conflict.

**freeze**—*See* nuclear freeze.

**fusion**—The process of combining atomic nuclei to form a single, heavier element or nucleus and to release large amounts of energy.

**general and complete disarmament (GCD)**—The total abandonment of military forces and weapons (other than internal police forces) by all nations at the same time, usually foreseen as occurring through an agreed schedule of force reductions. In 1961, in the so-called McCloy-Zorin Principles, the United States and the USSR agreed that their negotiations would have GCD as their ultimate objective.

**ground-launched cruise missile (GLCM)**—*See* cruise missile.

**hard or hardened target**—A target protected against the blast, heat, and radiation effects of nuclear weapons of specific yields. Hardening is usually accomplished by means of earth and reinforced concrete and is measured by the number of pounds per square inch of blast overpressure which a target can withstand.

**intercontinental ballistic missile (ICBM)**—A ballistic missile with a range of 4,000 or more nautical miles. Conventionally, the term ICBM is used only for land-based systems, to differentiate them from submarine-launched ballistic missiles, which also have an intercontinental range.

**intermediate nuclear forces (INF)**—A term coined by U.S. officials to emphasize the links between U.S. strategic weapons and theater weapons in Europe. In its original meaning it was synonymous with long-range theater nuclear forces (LRTNF). More recently, it has been expanded to include all TNF except battlefield weapons. Negotiations between the U.S. and the U.S.S.R., opened in November 1981, seek to limit the European-based, intermediate-range nuclear forces of both sides. (See also theater nuclear forces, long-range theater nuclear forces).

**kiloton**—A measure of the yield of a nuclear weapon, equivalent to 1,000 tons of TNT.

**launch-on-warning doctrine**—A strategic doctrine under which a nation's bombers and land-based missiles would be launched on receipt of warning (from satellites and other early-warning systems) that an opponent had launched its missiles. This doctrine is sometimes also called "launch on positive (or confirmed) notification of attack" to distinguish between possible and actual attack. Sometimes recommended for use when there is uncertainty over the ability of fixed-site strategic weapons (e.g., ICBMs) to survive an attack, a launch-on-warning doctrine is viewed as destabilizing in a crisis situation.

**light-water reactor**—The most common type of nuclear power reactor. It is fueled by enriched uranium. The spent fuel of a light-water reactor contains significant amounts of plutonium which could be used to make nuclear explosives.

**Mark 12A warhead**—A new warhead for the Minuteman III missile. The increased accuracy and yield of the Mark 12A re-entry vehicles in the warhead will increase the ability of the Minuteman III missiles to destroy hardened Soviet missile silos and other targets.

**megaton**—A measure of the yield of a nuclear weapon, equivalent to 1,000,000 tons of TNT.

**missile experimental (MX)**—A U.S. ICBM, now in the research and development phase, which is designed to replace the current ICBM force during the 1980s. This more accurate, powerful, and destructive missile could be deployed in either a single silo or mobile mode and would be capable of destroying Soviet missile silos.

**multiple independently-targetable re-entry vehicle (MIRV)**—A package of two or more re-entry vehicles which can be carried by a single ballistic missile and delivered on separate targets. The term MIRV is also commonly used for a missile with a MIRVed warhead or for the process of switching from single to multiple re-entry vehicles.

**mutual assured destruction**—A concept of reciprocal deterrence which rests on the ability of the two nuclear superpowers to inflict unacceptable damage on one another after surviving a nuclear first strike.

**national technical means (NTM)**—A method of verifying compliance with negotiated arms control agreements generally consistent with the recognized provisions of international law, commonly understood as surveillance by satellite and aerial reconnaissance.

**no-first-use doctrine**—A no-first-use pledge by a nation obliges it not to introduce nuclear weapons first into a conflict. (See first use.)

**nuclear freeze**—The generic term for a variety of proposals calling for a halt to the testing, production and deployment of all nuclear weapons and delivery systems. Proposals have been introduced in both houses of Congress, numerous local and town councils, and a variety of state legislatures. Referenda on the freeze will be on many state ballots in November 1982.

**nuclear fuel cycle**—Any process for developing, utilizing, and disposing of nuclear fuels.

**nuclear weapon-free zone**—An area in which the production and deployment of nuclear weapons is prohibited.

**on-site inspection**—A method of verifying compliance with an arms control agreement whereby representatives of an international or other designated organization, or of the parties to the agreement, are given direct access to view force deployments or weapon systems.

Continued on page 28

**parity**—A level of force in which opposing nations possess approximately equal capabilities.

**peaceful nuclear explosion (PNE)**—The non-military use of nuclear detonations for such purposes as stimulating natural gas, recovering oil shale, diverting rivers, or excavating.

**Pershing II (PII)**—Scheduled to begin deployment in 1983, the Pershing II is the successor system to the Pershing IA IRBM. The Pershing II incorporates the new RADAG guidance system, making it an extremely accurate and mobile weapon. 108 Pershing II missiles are to be deployed in Germany.

**plutonium**—An element not found in nature which is created as a waste product of nuclear reactors. Plutonium can be used to make nuclear weapons.

**pounds per square inch (psi)**—A measure of nuclear blast overpressure or dynamic pressure, used to calculate the effects of a nuclear detonation or the ability of a structure to withstand a nuclear blast.

**preemptive strike**—A damage-limiting attack launched in anticipation of an opponent's attack.

**proliferation**—The spread of weapons, usually nuclear weapons. Horizontal proliferation refers to the acquisition of nuclear weapons by states not previously possessing them. Vertical proliferation refers to increases in the nuclear arsenals of those states already possessing nuclear weapons.

**re-entry vehicle**—That part of a ballistic missile designed to re-enter the earth's atmosphere in the terminal portion of its trajectory.

**reprocessing plant**—A facility required to separate the uranium and plutonium present in spent reactor fuel. The plutonium recovered through reprocessing can be reused as reactor fuel or for nuclear explosives.

**sea-launched cruise missile (SLCM)**—*See* cruise missile.

**second strike**—A follow-up or retaliatory attack after an opponent's first strike. Second-strike capability describes the capacity to attack after suffering a first strike. The U.S. strategy of deterrence, is premised on high confidence in the ability of the United States to deliver a nuclear second strike that would inflict unacceptable damage on the nation which struck first.

**Standing Consultative Commission (SCC)**—A joint U.S.-U.S.S.R. negotiating body, established by the ABM Treaty, which meets semi-annually to review implementation of the ABM Treaty and other strategic arms limitation agreements in force.

**strategic**—Relating to a nation's offensive or defensive military potential, including its geographical location and its resources and economic, political and military strength. The term strategic is used to denote those weapons or forces capable of directly affecting another nation's war-fighting ability, as distinguished from tactical or theater weapons or forces.

**Strategic Arms Limitation Talks (SALT)**—Negotiations between the United States and the USSR initiated in 1969 which seek to limit the strategic nuclear forces, both offensive and defensive, of both sides.

**Strategic Arms Reduction Talks (START)**—Negotiations between the U.S.-U.S.S.R., formerly named SALT, which were started in June 1982 to seek reductions in the strategic arsenals of both sides. The change in name came as a result of the Reagan Administration's desire to emphasize reductions rather than mere limitations in nuclear weapons.

**Strategic Talks on Prevention of Nuclear War (STOP)**—An arms control negotiating position, proposed by Senator Gary Hart, which focuses specifically on measures to achieve stability and prevent the use of nuclear weapons.

**submarine-launched ballistic missile (SLBM)**—Any ballistic missile launched from a submarine.

**tactical**—Relating to battlefield operations as distinguished from theater or strategic operations. Tactical weapons or forces are those designed for combat with opposing military forces rather than for reaching the rear areas of the opponent or the opponent's homeland, which require theater or strategic weapons, respectively.

**theater nuclear weapon (TNW)**—A nuclear weapon, usually of longer range and larger yield than a tactical nuclear weapon, which can be used in theater operations. Many strategic nuclear weapons can be used in theater operations, but not all theater nuclear weapons are designed for strategic use. The Soviet SS-20 mobile missile is generally considered a theater nuclear weapon, as are the nuclear-capable U.S. fighter bombers deployed in the Far East and Europe and the U.S. Lance missile.

**throw-weight**—The maximum weight of the warheads, guidance unit, and penetration aids which can be delivered by a missile over a particular range and in a stated trajectory.

**Triad**—U.S. strategic forces which are composed of three parts: land-based intercontinental ballistic missiles; submarine-launched ballistic missiles; and long-range bombers.

**vertical short take-off and landing (V/STOL)**—Relating to the ability (of an aircraft) vertically to clear a 50-foot obstacle within 1,500 feet after takeoff or to stop within 1,500 feet over a 50-foot obstacle in landing. An advantage of V/STOL aircraft is that they are able to operate nearer the forward edge of the battle area.

**warhead**—That part of a missile, torpedo, rocket, or other munition which contains either the nuclear or thermonuclear system, chemical or biological agent, or inert materials intended to inflict damage.

**yield**—The force of a nuclear explosion expressed as the equivalent of the energy produced by tons of TNT. *See* kiloton and megaton.


## The Arms Control Association

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The Arms Control Association is a nonpartisan national membership organization dedicated to promoting public understanding of effective policies and programs in arms control and disarmament. Formed in 1971 by a group of concerned individuals with extensive experience in the fields of arms control, disarmament, and national security policy, the Association seeks to create broad public appreciation of the need for positive steps toward the limitation of armaments and the implementation of other measures to reduce international tensions on the road to world peace. Under a cooperative agreement, the Association participates in a number of joint ventures with the Carnegie Endowment for International Peace.



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